SAVE UP TO $1,000.00

ON YOUR NEXT GAS FORK TRUCK PURCHASE

BAKER "Yardloader" 4000 POUND CAPACITY

Here's a fork truck built for rugged outdoor service. Large pneumatic tires, exceptionally high ground clearance and oscillating rear axle permit its operation on unimproved or semi-improved ground surfaces. Powerful heavy-duty industrial engine, extra-heavy drive axle, and 4-speed transmission assure ample power for rough work. Travel speed approaching 14 MPH in high gear enables it to cover large areas efficiently. It's safe and easy to operate, featuring convenient controls, automotive type steer and excellent driver visibility. Hydraulic lift permits stacking to 122 inches.

But the outstanding feature of the Yardloader is its amazing low price—about 25% under any other gas truck in its capacity.

Get all the facts—and save up to $1000.00 on your next gas fork truck.

Send in this coupon today.

THE BAKER-RAULANG COMPANY

1251 West 80th Street • Cleveland 2, Ohio

The Baker-Lull Corporation • Subsidiary, Minneapolis, Minn.
Materials Handling and Construction Equipment

TO THE BAKER-RAULANG CO., 1251 West 80th St., Cleveland 2, Ohio

Please send me information and specifications on the new Baker EY-40 Yardloader which sells for only $2985.00.

Name_____ Title_____

Company_____

Address_____

City_____ State_____

For more facts circle 502 on Reply Card

RICHARD H. MORRIS
Editorial Director

EDITORIAL STAFF

THOMAS E. HANSON, *Editor*
R. L. MARINELLO, *Managing Editor*
EMIL B. SKUBIK, *Associate Editor*
H. E. B. ANDERSON, *Associate Editor*
M. E. HENIKEN, *Equipment Editor*
A. W. KRAMER, *Electrical Editor*
M. E. WEISSMAN, *Editorial Production*
DOLORES ROSCOE, *Editorial Assistant*
JAMES E. WILCOX, *Staff Artist*
R. W. KOSTER, *Chief Draftsman*

Technical Publishing Co.
110 S. Dearborn St.
Chicago 3, Ill.

KINGSLEY L. RICE, *President*
EDWIN C. PROUTY, *Exec. Vice Pres.*
WALTER PAINTER, *Vice President*
EDWIN C. PROUTY, JR., *Secretary*
ARTHUR L. RICE, JR., *Treasurer*
JOHN O. AARVOLD, *Prod. Manager*

RICHARD M. WARD
Vice President in Charge of Sales

DISTRICT MANAGERS

BOSTON: Edmund J. Shea
258 Park Square Bldg.
Boston, Mass.
Phone: HAncock 6-4639

CHICAGO: John R. Morrison
Walter Painter
110 S. Dearborn St., Chicago 3, Ill.
Phone: DEarborn 2-5446

CLEVELAND: Richard M. Ward
F. Allen Schmidt
2945 Fairmount Blvd.
Cleveland Heights, Ohio
Phone: Fairmount 1-0616

DETROIT: Richard M. Ward
2230 Park Ave., Room 7
Phone: Woodward 5-2268

NEW YORK: Richard Y. Fuller
1613 Graybar Bldg., New York 17, N. Y.
Phone: Murray Hill 5-3779

PHILADELPHIA: Oscar Wilds
1235 Jericho Road, Abington, Pa.
Phone: Ogontz 6843W

PITTSBURGH: James B. Tafel
404 Frick Bldg., Pittsburgh, Pa.
Phone: COurt 1-4878

DENVER: McDonald-Thompson
Robert H. Heidersbach
222 Colorado Nat'l Bank Bldg., Denver 2, Col.
Phone: Keystone 4669

PACIFIC COAST: McDonald-Thompson
J. Leslie Meek, 625 Market St.
San Francisco 5, Cal., Phone YUkon 6-0647
Connie J. Grabb, 3727 West Sixth Street
Los Angeles 5, Cal., Phone: Dunkirk 7-5391
Harry Abney, 1008 Western Ave.
Seattle 1, Wash., Elliott 3767

SOUTHWEST: McDonald-Thompson
Frank N. Vickrey, Rm. 214
3217 Montrose Blvd., Houston 6, Texas
Phone: LYnchburg 6711

BPA NBP

Copyright, 1954 by Technical Publishing Co.

'ROUND ABOUT with the editors in field and office

Edited by R. L. Marinello

Promotions at Sharp & Dohme

Thomas M. Shea, former plant engineer, Sharp & Dohme, Division of Merck & Co., Inc., has been transferred to the position of chief design engineer.

Philip Damm was transferred from assistant plant engineer to plant engineer of the West Point plant of Sharp & Dohme.

Hermann Marnet, formerly project engineer, was appointed plant engineer of the Philadelphia and Glenolden plants of Sharp & Dohme.

New Plant Engineer

Robert W. Tolles was recently named plant engineer for the main plant of The Stanley Works in New Britain, Connecticut.

He joined the electrical department of the company in 1939 and was subsequently transferred to the electric tool division in 1941. After service in the U.S. Navy as a fire control specialist with the Bureau of Ordnance, he returned to The Stanley Works as assistant power engineer and three years later became maintenance superintendent.

For Air Force Reserve Officers

AIR FORCE reserve officers, experienced in plant engineering or production engineering and interested in a mobilization assignment in the office of the Deputy Chief of Staff, Materiel Headquarters USAF, should write to Colonel Richard H. Morris, Editorial Director, PLANT ENGINEERING, 110 South Dearborn St., Chicago 3, Ill., and include a short summary of their civil and military experience. There are also a few openings for officers with construction, transportation, material control experience.

NSPE Will Meet in Milwaukee

NATIONAL SOCIETY of Professional Engineers will hold the twentieth annual meeting in Milwaukee, Wisconsin, June 9 to 12.

Engineer-members of the 39 state societies will meet in Milwaukee's Schroeder Hotel where they will hear officers and committee chairmen report on the past year's accomplishments and exchange views on topics of general interest to the profession. The installation of officers for the 1954-55 administrative year will also take place at this annual get-together.

Welcome Letter from a Reader

"My March, 1954, issue of PLANT ENGINEERING has just arrived and it serves to remind me that before the April issue comes to hand I will have retired from my position at Dictaphone Corp. As a matter of fact, Mr. M. H. Weiss was appointed plant engineer around the first of the year, and I am staying on until April 15, 1954, in an advisory capacity.

"I have enjoyed receiving copies of PLANT ENGINEERING monthly and I think I have a complete file of the magazine from the very first issue. The amazing part is the growth which it has experienced. You have made it into a magazine which is a credit to any profession and I am sure that the status of plant engineer has risen considerably since you started its publication.

"This gives me an opportunity to thank you sincerely for sending me the monthly issues and to wish you continued success in your undertaking." *M. R. Blish, Plant Engineer, Dictaphone Corp., Bridgeport, Connecticut.*

Plant Engineer in the Making

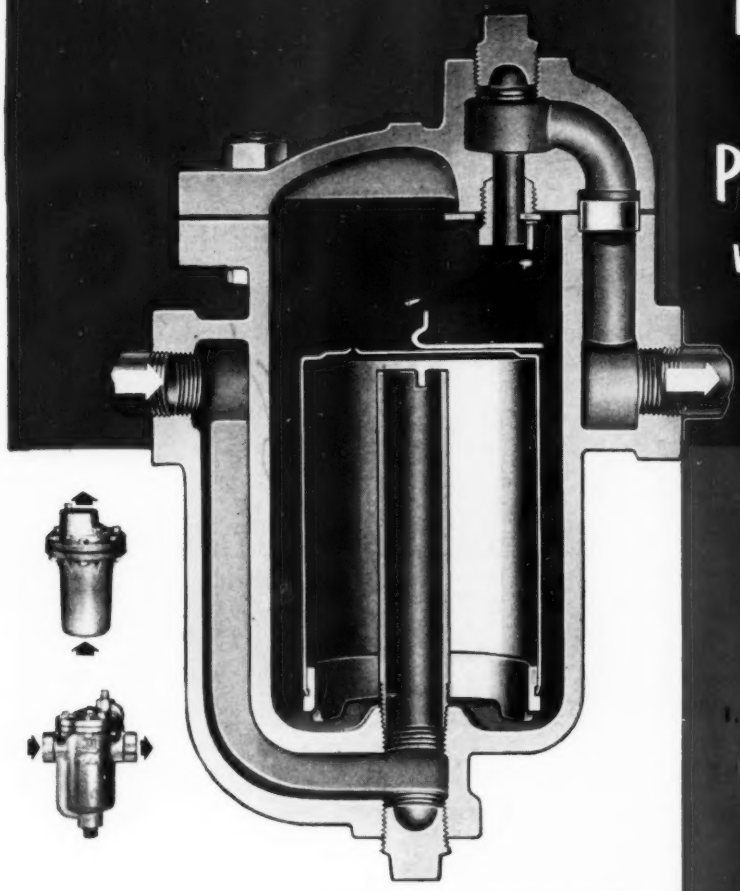
Raymond W. Lee was recently promoted to the newly created postion of maintenance engineer. As such, he will be directly responsible to the plant engineer for the coordinated operation of the maintenance departments of the Detroit Sash plant of Detroit Steel Products Co. He will also assist the plant engineer in advising the branch plants about maintenance problems.

New Plants in Sight

C. I. Hayes, Inc., is constructing a new plant at Cranston, Rhode Island, designed expressly for making industrial electric heat treating furnaces . . . Site preparation work has begun for the new **Caterpillar Tractor Co.** plant at Decatur, Illinois . . . **Seiberling Rubber Co.** is building a one-story building in Newcomerstown, Ohio, for the exclusive production of plastics . . . **The Marley Co.** has built a new plant in Louisville to meet the increased demand for its mechanical draft cooling towers . . . Construction has started in Gardena, California, on a plant and office building for the Die-Casting Div.

Plant Engineering is published monthly at Chicago, Ill. Subscriptions one year $10 in the U. S. A. Canada $11; Elsewhere $12. Acceptance under Section 34.64, P. L. & R. authorized by Post Office.

MORE TRAP CAPACITY PER DOLLAR with Armstrong two-phase leverage



Two-phase steam trap leverage is an original development by Armstrong and has been incorporated in Armstrong traps since the memory of most engineers runneth not to the contrary. It provides:

1. High initial leverage to open the valve against pressure.
2. Secondary lower leverage which permits the valve to travel well clear of the seat to minimize restriction to flow of condensate.

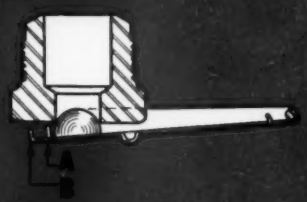
A single-phase lever can open just as large a valve *or* give just as great valve travel, *but not both.* Thus, Armstrong two-phase leverage gives very much greater capacity, depending on trap size than the earlier leverage system.

No steam trap gives greater actual hot condensate capacity, size for size, and dollar for dollar, than an Armstrong!

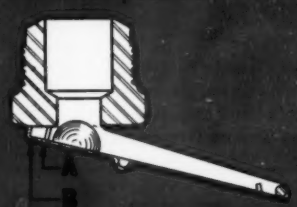
For complete data call your local Armstrong Representative or send for the 44-page Steam Trap Book.

ARMSTRONG MACHINE WORKS
912 Maple Street, Three Rivers, Michigan

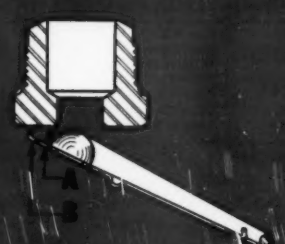
HOW IT WORKS:



1. Valve in closed position.



2. As the bucket starts to sink, the lever fulcrums at "A", giving high leverage to open the valve against pressure. When valve is well open, the secondary fulcrum "B" touches the face of the valve seat.

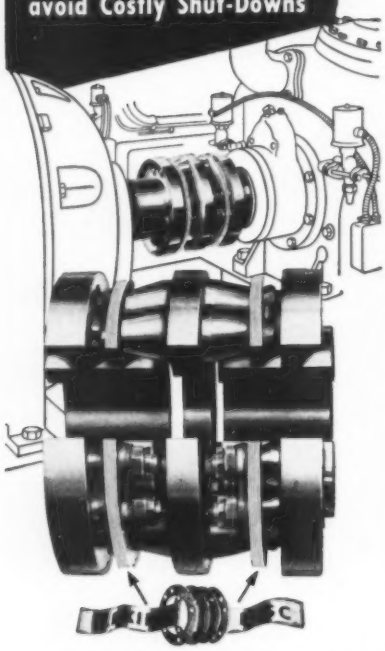


3. Additional bucket travel results in fulcrum "B" becoming the pivot, permitting the valve to be opened wider so that restriction to flow of condensate is minimized.

ARMSTRONG STEAM TRAPS

For more facts circle 503 on Reply Card

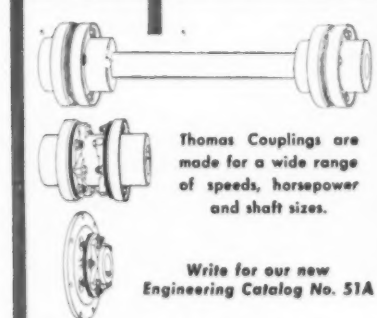
Specify THOMAS ALL METAL FLEXIBLE COUPLINGS for Power Transmission to avoid Costly Shut-Downs



Patented Flexible Disc Rings of special steel transmit the power and provide for parallel and angular misalignment as well as free end float.

DISTINCTIVE ADVANTAGES

FACTS	EXPLANATION
NO MAINTENANCE	Requires No Attention. Visual Inspection While Operating.
NO LUBRICATION	No Wearing Parts. Freedom from Shut-downs.
NO BACKLASH	No Loose Parts. All Parts Solidly Bolted.
CAN NOT "CREATE" THRUST	Free End Float under Load and Misalignment. No Rubbing Action to cause Axial Movement.
PERMANENT TORSIONAL CHARACTERISTICS	Drives Like a Solid Coupling. Elastic Constant Does Not Change. Original Balance is Maintained.



Thomas Couplings are made for a wide range of speeds, horsepower and shaft sizes.

Write for our new Engineering Catalog No. 51A

THOMAS FLEXIBLE COUPLING CO.
WARREN, PENNSYLVANIA, U.S.A.
For more facts circle 504 on Reply Card

'ROUND ABOUT

of the **Martin-Ruegg Brass and Aluminum Foundry** . . . Earth-moving bulldozers and graders started clearing land for construction of a modern plant for **Townsend Co.** at Ellwood City, Pennsylvania . . . **Tenney Engineering, Inc.,** has moved into its new plant at 1090 Springfield Road, Union, New Jersey, which consolidates and enlarges the previous facilities at the old plants.

Facts About Lead

HELPFUL INFORMATION on lead and lead products has been compiled in a 44-page booklet from the collected data on past performance of the many uses of lead in industry. Although the booklet is directed to the chemical process industries, the information in the booklet should prove valuable to other industries, as well.

In addition to all the material covering lead as a construction material and its many fitting uses, the booklet also tells about the grades of lead, sizes and weights of sheet lead, and includes a selection guide for lead valves, as well as pertinent information on lead burning.

Reference notes and conversion tables on properties of lead, safe working pressures, sulfuric acid data, eutectics of lead, water data, table of equivalents, heat transfer and other miscellaneous data are also included in the back portion of the booklet.

Additional information about this booklet or on any of the phases mentioned above, may be obtained by writing to Federated Metals Division, American Smelting and Refining Co., 120 Broadway, New York 5, N. Y.

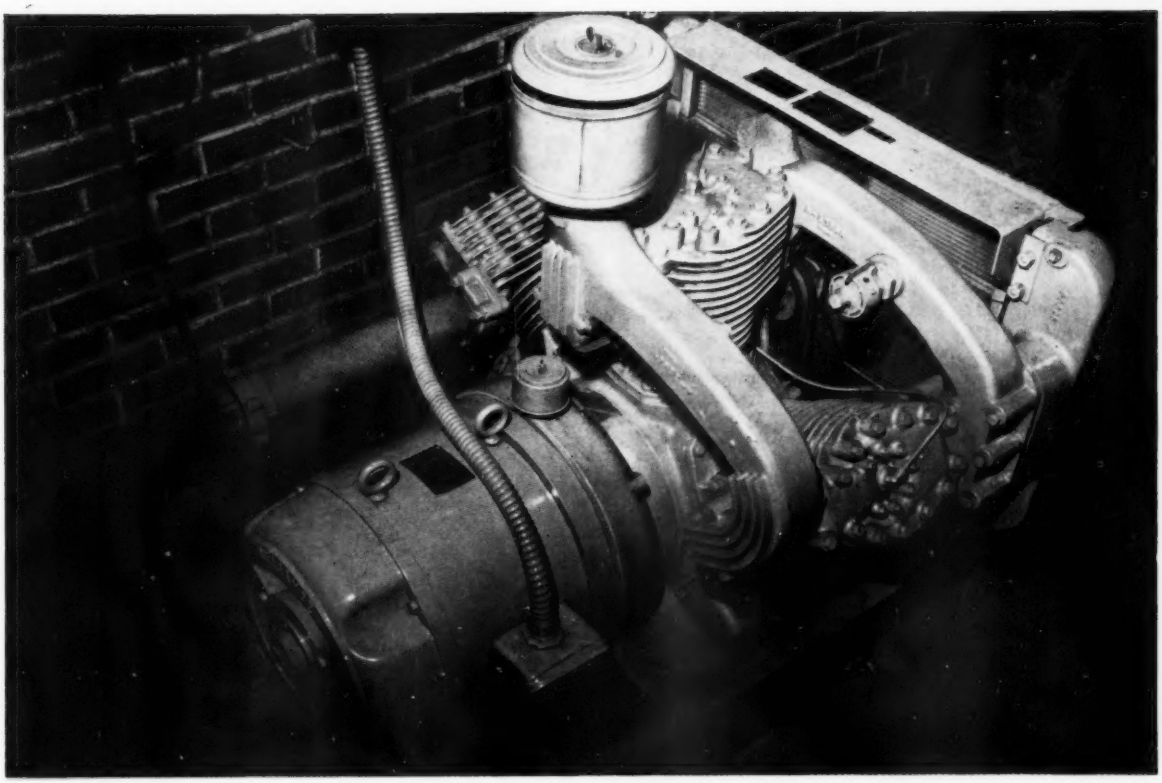
News from Philadelphia and New York PE Clubs

Philadelphia—In addition to conducting its business meeting, the Plant Engineers' Club of Greater Philadelphia, honored two of their past presidents, Robert F. McCaw and James R. Clemens, with gifts in appreciation of their services to the Club.

New York—At the March meeting, the New York Plant Engineers' Association listened to an interesting talk by Messrs. Mayerbach, Steeneck and Baumhoff of the S. J. O'Brien Co. outlining the principles of a freon refrigerating system. Their working model with a transparent evaporator and piping showed clearly the workings of the controls and behavior of the refrigerant.

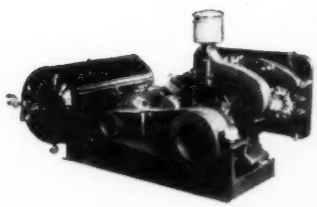
Plant tour of the Harrison, New Jersey, plant of Worthington Corp. is scheduled for the April meeting. The tour will include the foundries, machine shops, welding shop, commercial test department, research and power house. In May they will have their annual Ladies' Night meeting.

Officers of the Plant Engineers' Club of Greater Philadelphia are, left to right: B. W. Van Dyke (director) Standard Pressed Steel Co.; W. F. Ferris (secretary) Electric Storage Battery Co.; J. M. Waligora (president) Sharp & Dohme, Div. of Merck & Co., Inc., presents gift to R. F. McCaw (past president) RCA-Victor Division; J. R. Clemens, (past president), Link-Belt Co., receives gift from D. Godschall (1st pres.) Heintz Mfg. Co.; D. West (vice-pres.) Simonds Abrasive



SAVE ALMOST A MILE EVERY HOUR IN PISTON WEAR WITH A JOY WL-80 COMPRESSOR—

* *Piston speed is lower than that of four comparable compressors. So low that you save over 6½ miles of wear each 8-hour day.*



Joy WL-80 "Packaged Unit" Compressor can be delivered ready-to go, complete with air receivers, piping and wiring.

NEED A SMALL, COMPACT COMPRESSOR as an auxiliary air supply? Or possibly you want a compressor that can be placed right where the air is used and eliminate long runs of piping.

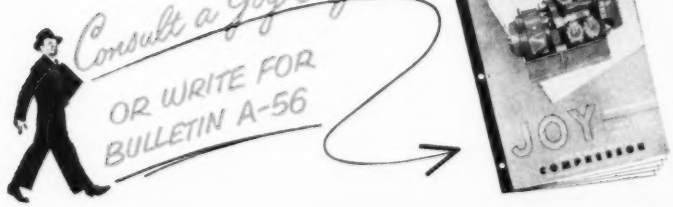
If your requirements call for 640 CFM or less, there's a Joy WL-80 for you:

- *15 to 125 HP.*
- *81 to 641 CFM.*
- *Pressures to 125 psi, standard. (High pressure units to 250 psi).*
- *Single or two stage.*
- *Air cooled.*
- *Force-feed lubrication.*
- *Eleven models.*

. . . And, you have your choice of drives: Direct, V-Belt, Flange-Mounted. In fact, these compressors are available as packaged units, like that shown at the left, delivered complete with air receivers, piping and wiring.

* * *

Get full details by writing for Bulletin A-56. ● ***Joy Manufacturing Company, Oliver Building, Pittsburgh 22, Pa.*** In Canada: *Joy Manufacturing Company (Canada) Limited, Galt, Ontario.*



WaD 4942

JOY

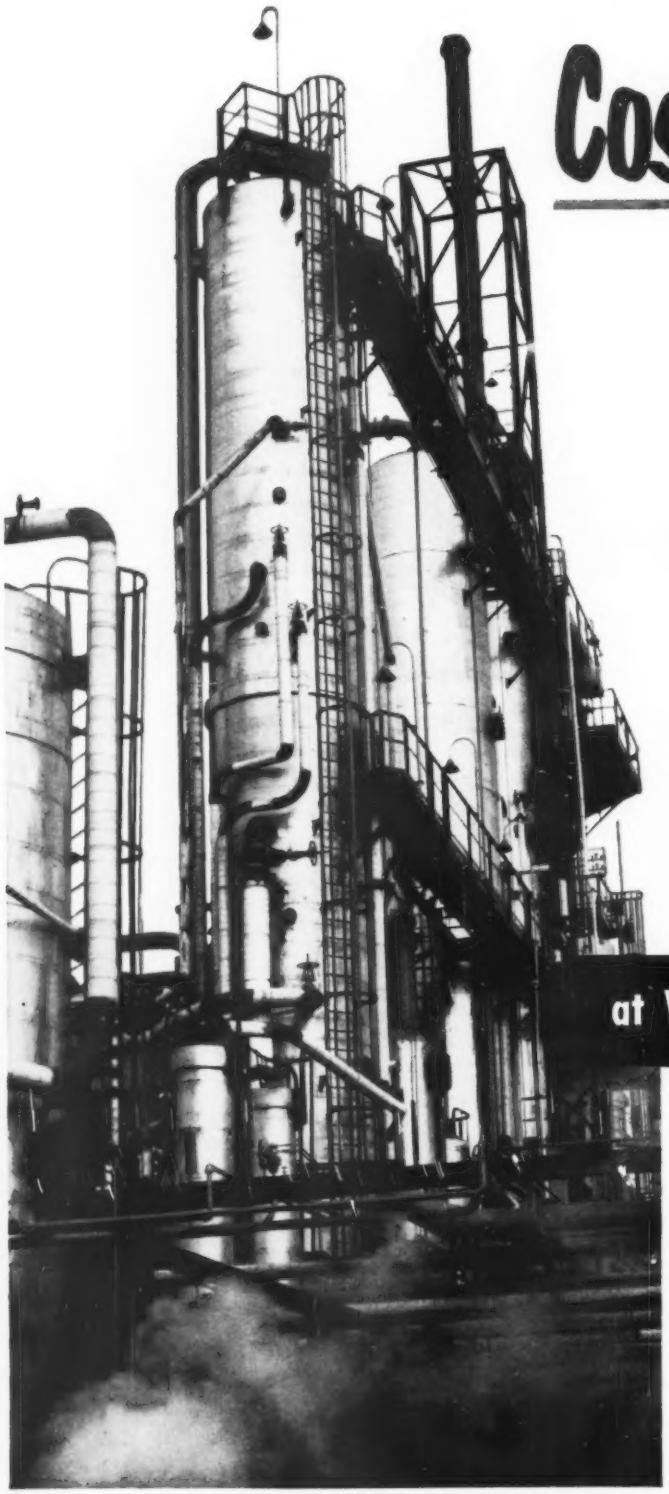
SPECIALISTS IN THE COMPRESSION AND MOVEMENT OF AIR AND GASES SINCE 1885

For more facts circle 505 on Reply Card

FROM MINNESOTA

at points beyond

Cost Conscious



All across our land, plant owners and managers *call* on Carey for *real* help in cutting costs! It has been that way for over 80 years!

Carey Insulations, for example, conserve heat and fuel, help control temperatures and processes in thousands of plants. Careystone Siding and Roofing, corrugated for strength, permits fast, economical remodeling and construction of maintenance-free buildings. Careystone is practically indestructible, won't burn, rust, rot or decay. Needs no preservatives—ever!

at Wrenshall, Minnesota

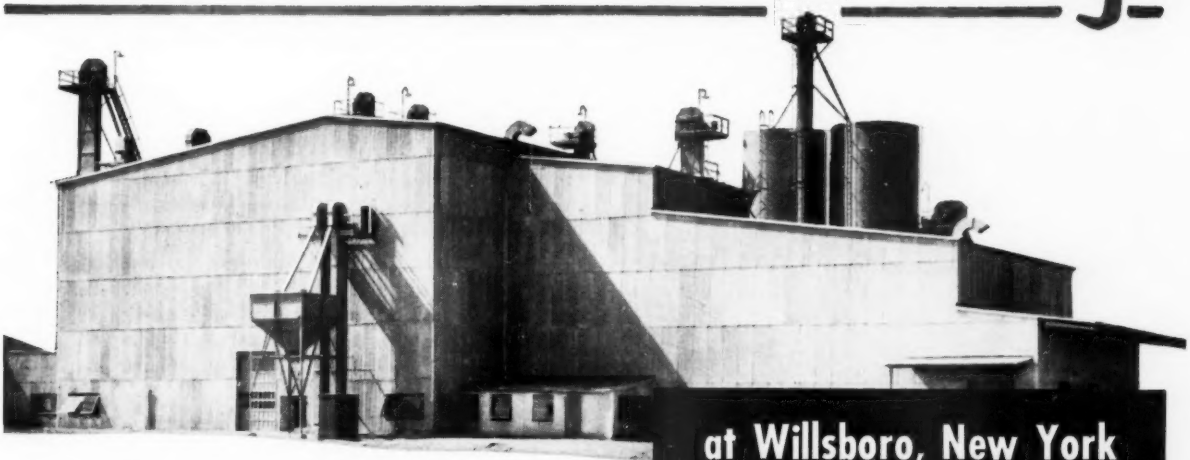
. . . Carey Heat Insulations save fuel, improve efficiency at new $7,000,000 International Refineries, Inc., plant!

Carey Tempchek blocks and pipe coverings, combined with *Carey Super* "85%" *Magnesia* in precision-sized, pre-formed blocks and nesting pipe coverings, conserve heat and fuel at 170-acre plant of International Refineries, Inc., Wrenshall, Minnesota. Both insulations feature low thermal conductivity, moisture and shock resistance, high compressive strength, permanence and easy workability!

TO NEW YORK...

and in between...

Plant Owners call on Carey!



at Willsboro, New York

. . . Carey Building Materials beautify and protect new $2,000,000 Minerals Division Plant of The Cabot Carbon Company!

Careystone Siding and Roofing cut construction costs to the bone at Cabot Carbon Company's new Willsboro, New York plant. Careystone—made of asbestos and Portland cement—comes in big 42" x 8' sheets that cover fast. It can be applied vertically or horizontally over steel or wood framings, and sawed to fit irregular areas. Careystone won't burn, corrode, rust, rot or decay, and actually *gains* strength with exposure to weather. *Carey Asbestos Roofing* "tops" the new plant—gives management 20-year protection, and more, against weather of all extremes!

Your Carey Industrial Sales Engineer will be happy to tell you more about these and other Carey products for industry. He's trained to quickly spot heat and weather leaks in your plant; to show you, in minutes, how Carey products will improve its efficiency, appearance and weather-worthiness!

For *real* help in cutting costs, call in your Carey Industrial Sales Engineer soon. Or write Department FFM-5 in Cincinnati and outline your problem.

Carey

The Philip Carey Mfg. Company

CINCINNATI 15, OHIO

In Canada: The Philip Carey Co., Ltd., Montreal 3, P. Q.

Mail this coupon for specific information of products listed!

The Philip Carey Mfg. Company **Dept. PE-5**
Cincinnati 15, Ohio

Send literature for products checked

☐ Careystone ☐ Thermal Insulation ☐ Built-up Roofing

NAME_____

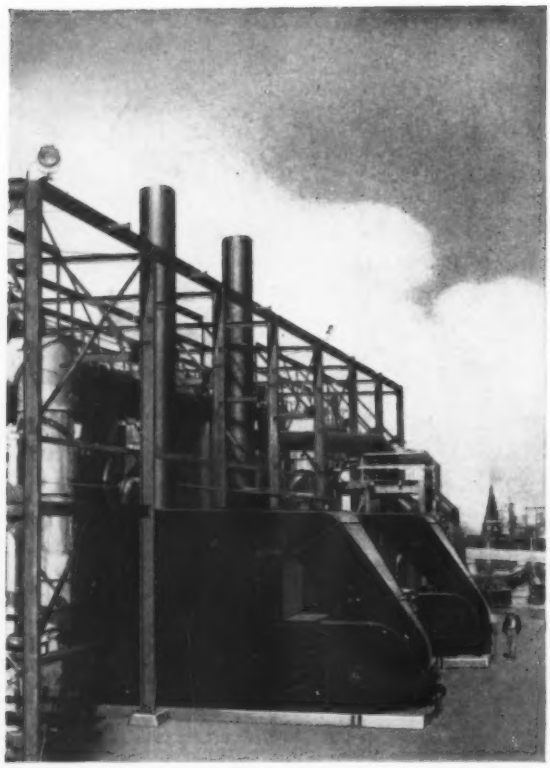
COMPANY_____

ADDRESS_____

CITY_____ ZONE____ STATE_____

For more facts circle 506 on Reply Card

How to get rid of industrial fumes



American Blower Fans help get rid of fumes in this catalytic fume disposal installation at a modern chemical plant.

Revolutionary, new Catalytic Combustion process uses American Blower Fans to help convert hazardous industrial fumes to odor-free, color-free gases

An ingenious, low-temperature oxidation process developed by the Catalytic Combustion Corporation, Detroit, Michigan, uses American Blower Fans to help convert organic industrial fumes into odorless, colorless (and harmless!) gases – plus useful heat energy.

The secret of this fume-destroying system is the Suter-Ruff Catalytic Element: a closely packed mat of heat- and corrosion-resistant metallic ribbons, coated with platinum alloy, and conditioned to produce catalytic action.

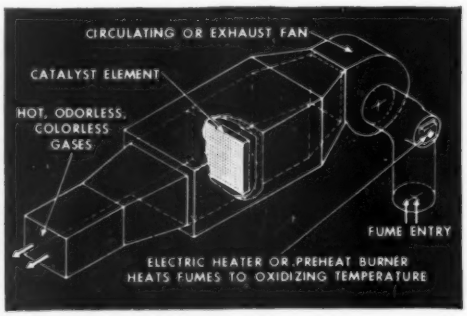
Catalytic Combustion occurs when burnable fumes are passed through this catalytic element. Fume destruction is complete, whether fumes are present in traces or heavy concentrations.

Good velocity and distribution of fumes through the mat is a *must* for effective use of the entire catalyst area. Catalytic Combustion Corporation relies on American Blower Fans in its installations to do this important job; they've found that American Blower Fans are efficient, long lived, quiet in operation.

If *you* have an air-handling problem, feel free to call on American Blower engineers – any time. Just phone your nearest American Blower or Canadian Sirocco Branch Office.

Suter-Ruff Catalytic Element

Small in size, the Suter-Ruff Catalytic Element is capable of handling large volume. During fume oxidation, temperatures jump as much as 600° F. – furnishing heat that may be utilized in manufacturing.


CIRCULATING OR EXHAUST FAN
CATALYST ELEMENT
HOT, ODORLESS, COLORLESS GASES
FUME ENTRY
ELECTRIC HEATER OR PREHEAT BURNER HEATS FUMES TO OXIDIZING TEMPERATURE

The Catalytic Combustion Process

For catalysis to take place, fumes must be preheated with an electric heater or preheat burner. American Blower fans provide the needed mixing, circulation and exhaust of fumes at elevated temperatures. Catalytic Combustion eliminates fire hazards, condensate in ducts, air pollution.

Sirocco Induced Draft Fan

American Blower Fans are used extensively for forced and induced draft, ventilating, air conditioning, drying, fume removal, and processing systems. Write to us for Literature on our complete line of products.

AMERICAN BLOWER CORPORATION, DETROIT 32, MICHIGAN • CANADIAN SIROCCO COMPANY, LTD., WINDSOR, ONTARIO
Division of American Radiator & Standard Sanitary Corporation

YOUR BEST BUY AMERICAN BLOWER AIR HANDLING EQUIPMENT

Serving home and industry: AMERICAN STANDARD • AMERICAN BLOWER • CHURCH SEATS & WALL TILE • DETROIT CONTROLS • KEWANEE BOILERS • ROSS EXCHANGERS • SUNBEAM AIR CONDITIONERS

For more facts circle 507 on Reply Card

Are these your major interests?

Among the first 10 major interests of engineers as recently surveyed by "Machine Design" are:

REDUCED COSTS—The greater use of Diamond Roller Chains for power transfer from power source and from shaft to shaft simplifies design. Shafts can be located where most economical from the structural standpoint.

DECREASED MAINTENANCE—Because of the long-life dependability and inherent elasticity of Diamond Chains, maintenance work is reduced. Since there is no slip or stretch, adjustments are not required.

GREATER PRECISION—Speed ratios are maintained because Roller Chains are as positive as gears.

WEIGHT REDUCTION—Gear trains which add their weight and that of extra shafts and bushings are not present when the drives are Diamond Roller Chains. They are light in relation to power transmission capacities and tensile strengths.

HIGHER SPEEDS—Diamond Roller Chain applications include drives up to 5000 h.p. and at speeds up to 10,000 r.p.m.

DIAMOND
ROLLER CHAINS
Can help you!
Design and manufacturing engineers connected with leading machinery and equipment makers have had many years of long-life performance proof to back up their wide use of Diamond Roller Chains . . . The experienced Diamond engineering staff is at all times ready to make time-saving, practical recommendations. Catalog 754 mailed on request.
DIAMOND CHAIN COMPANY, Inc.
Dept. 61, 402 Kentucky Avenue, Indianapolis 7, Indiana
Offices and Distributors in All Principal Cities
Please refer to the classified section of your local telephone directory under the heading CHAINS or CHAINS-ROLLER
SHOT-PEENING SINCE 1944
Diamond Chain has long recognized that certain types of internal stressing of chain parts would increase fatigue resistance. To this end, link plates have been specially processed and chain rollers and other parts have been shot-peened since 1944.
DIAMOND
ROLLER CHAINS

For more facts circle 508 on Reply Card

For more facts circle 509 on Reply Card →

ALL THE FEATURES *plus*....

SQUARE D's
NEW
POWER-STYLE

SWITCH BOARDS

DESIGN LEADERSHIP FEATURES

Distinctive Styling provides an attractive, modern appearance matching the control center design.

Easier Installation because removable front and back plates expose generous wiring parts. Isolated horizontal wiring trough has drop-off openings, assuring safer, neater wiring.

Flexibility. Complete sections or branch units can be added or changed to meet specific job requirements.

Easier Inspection and Maintenance. Front, side and back plates are removable, thus providing easy and immediate access to specific areas.

SEPARATELY OR AS A TEAM....

Write for Bulletin SD-18. Address Square D Company, 6060 Rivard Street, Detroit 11, Michigan.

SQUARE D COMPANY

MATCHED ENCLOSURES!

SQUARE D's
NEW
PLUG-IN
CONTROL CENTERS

DESIGN LEADERSHIP FEATURES

Increased Safety because bus bars are fully enclosed, rigidly supported and have ample cross section...circuits isolated by individually enclosed plug-in units...disconnect handle designed for maximum operator protection.

Flexibility. Individual plug-in units or complete sections can easily be added, removed or exchanged. Push-buttons, pilot lights, and selector switches can readily be added to unit doors.

Installation Economy. All wiring channels are large and accessible from front without removing units...no "wire fishing."

Space economy, too. Up to six combination starters fit in a 20"x20"x 90" section. Plug-in unit heights are designed in space-saving increments of 3 inches.

....THEY DO THE JOB BETTER!

Write for Bulletin 244. Address Square D Company, 4041 N. Richards St., Milwaukee 12, Wisconsin.

ASK YOUR ELECTRICAL DISTRIBUTOR FOR SQUARE D PRODUCTS

JalKlamp slings

Have Full Rope Strength . . . at Lower Cost

J&L's new JalKlamp gives wire rope slings and terminals a permanent grip of steel. And it does it *compactly, economically*. No more corrosion . . . loose thimbles . . . jagged ends . . . or temporary splices.

Made of a special non-corrosive alloy, JalKlamp is an exceptionally strong sleeve with unique cold forming characteristics. When the JalKlamp is hydraulically pressed around wire rope, the metal "flows" into the spaces between the wires in the strands and between the strands themselves, producing a neat, homogeneous splice as strong as the rope itself.

JalKlamp slings and terminals are available for all standard wire rope constructions and in diameters ranging from ⅛″ to 1¼″, with SpringKore, PlastiKore, Fiber Core, and Independent Wire Rope Centers.

Specify JalKlamp slings and terminals and get these features:

1. **High strength—assures full catalog strength of the rope.**
2. **Economical—mass produced with less rope required, cutting your present sling costs.**
3. **Non-Corrosive—salt water resistant.**
4. **Neat, safe—JalKlamp splices are shop-finished—have no jagged edges to tear clothing or hands.**
5. **Permanent—JalKlamp splices are permanently secured under high pressure—will remain in good condition for the life of the rope.**
6. **Watertight—prevents internal corrosion.**

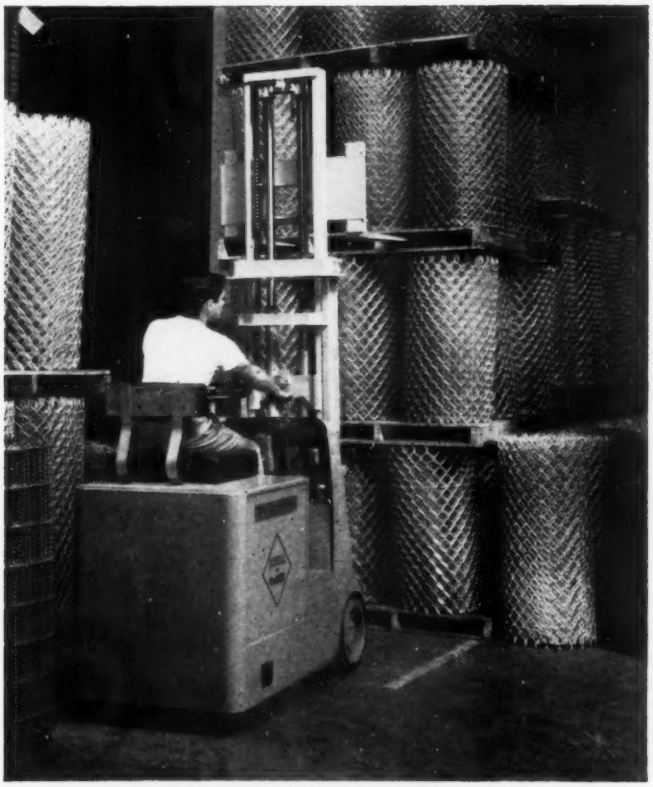
Jones & Laughlin
STEEL CORPORATION — *Pittsburgh*

J&L STEEL

For more facts circle 510 on Reply Card

B.F.Goodrich

FREE TW TIRE AND WHEEL ANALYSIS can lower over-all tire costs as much as 50%

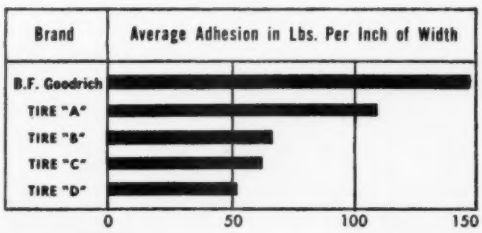


Savings of as much as 50% on industrial tire costs have been reported by users across the country through the use of the B. F. Goodrich Tire and Wheel Analysis Plan! Tire maintenance costs have been reduced 20% and more! This free analysis plan can save *you* money, too. Merely contact your local BFG retailer or mail the coupon below. Without cost or obligation, a trained B. F. Goodrich man will study your materials handling operations. He will tell you what type and size tires, what tread design and compound will serve you best.

The advice and counsel you get will be unbiased, for B. F. Goodrich makes a *complete* line of industrial tires. A special TW Analysis is available for manufacturers of industrial hauling equipment.

AVOID TIRE FAILURES LIKE THIS. Poor adhesion of rubber to steel caused this tire to fail prematurely. The chart below, based on extensive comparison tests of leading makes of tires, proves the superior adhesion qualities built into BFG solid industrial tires.

Tests Prove B. F. Goodrich Adhesion Best



Cutting and chipping? Uneven or littered hauling surfaces soon ruin tires. BFG's TW Analysis shows you how to get maximum tire life.

Hauling surfaces, heat, inside or outside hauling, weight of loads—all must be considered in order to select the right tire. Let the BFG man solve these problems for you.

RESEARCH KEEPS B.F.Goodrich FIRST IN RUBBER

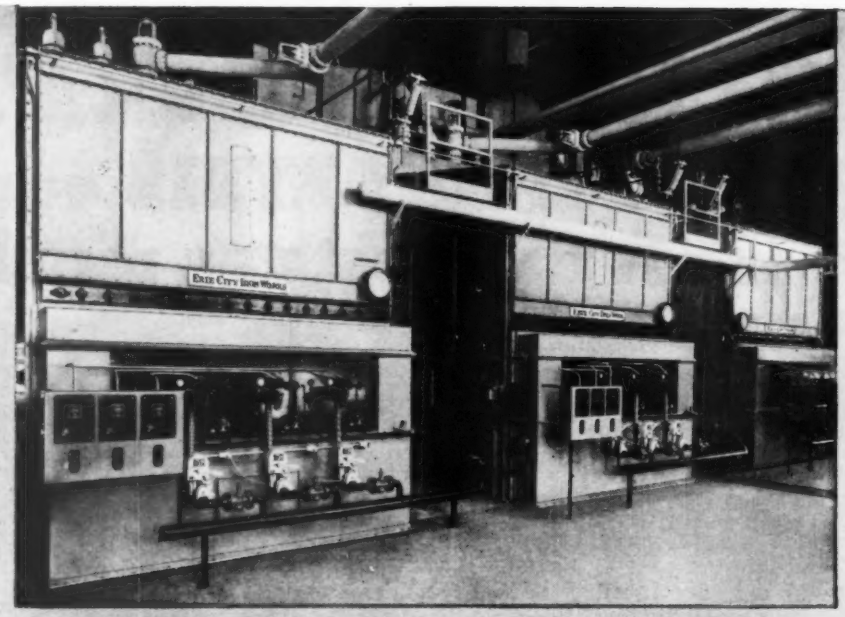
Specify B. F. Goodrich tires when ordering new equipment

The B. F. Goodrich Company
Tire & Equipment Division
Department TW- 386
Akron 18, Ohio

Please send me:
- ☐ Additional information on your Tire and Wheel Analysis Plan
- ☐ Free copy of "Industrial Tire Guidebook"
- ☐ Free copy of "How to Get Extra Service out of Solid Industrial Tires"

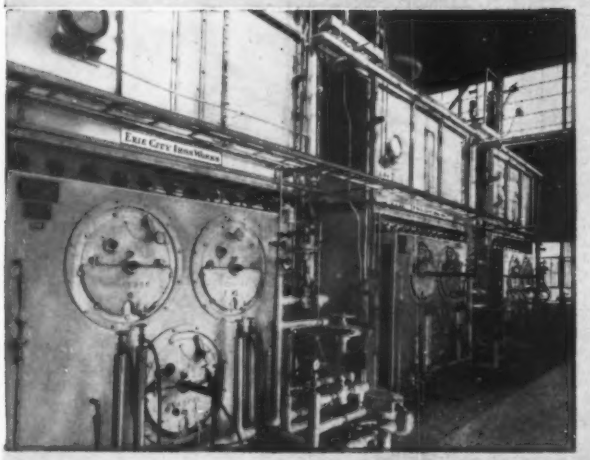
Name_____
Company_____
Street_____
City_____ Zone____ State____

For more facts circle 511 on Reply Card

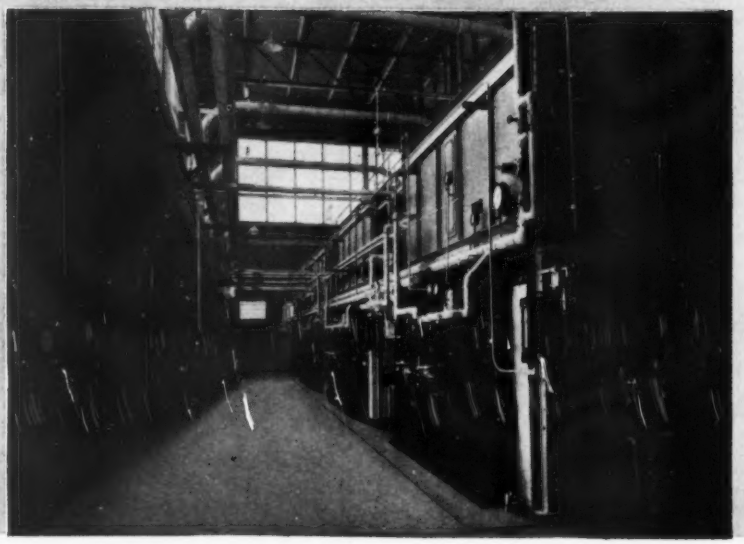


3—Erie City VC's—each 27,000 pounds of steam per hour—oil and gas fired.
A Midwest Capitol Heating Plant

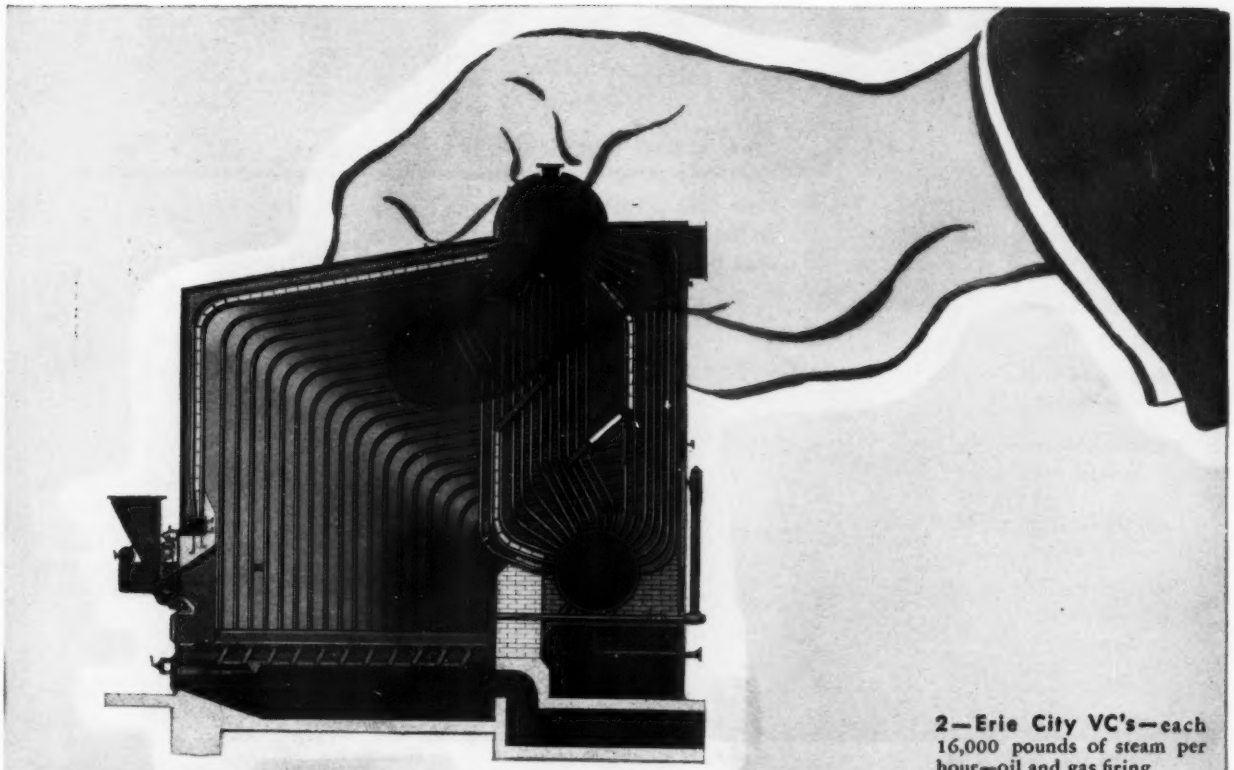
MODERN USE VC's



3—Erie City VC's—each 22,000 pounds of steam per hour—oil and gas fired.
A California Institution

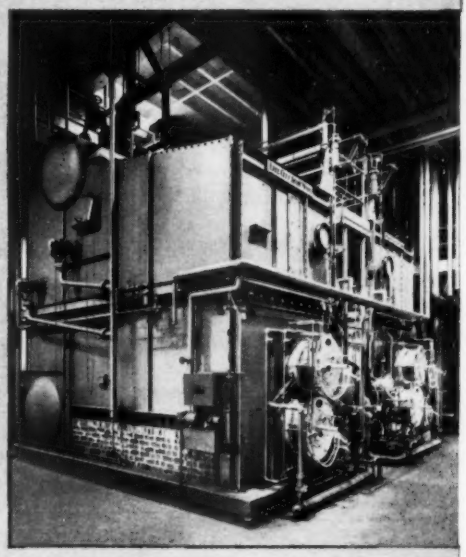


4—Erie City VC's—each 33,000 pounds of steam per hour—oil fired.
U. S. Government



2—Erie City VC's—each 16,000 pounds of steam per hour—oil and gas firing.
● *A California Hospital*

POWER PLANTS FOR *Economy*



● **ECONOMY OF INSTALLATION**
Erie City VC's are built in standard sizes and are compact; utilizing every available cubic foot of space either as furnace volume or as space for heat absorbing tubes.

● **ECONOMY OF MAINTENANCE**
These boilers are completely steel encased, have water cooled furnace walls, and ring flow circulation, giving the user a clean, easily maintained boiler room and eliminating costly refractory repairs.

● **ECONOMY OF OPERATION**
Multiple VC installations insure peak efficiency regardless of load condition. Adaptability to all methods of firing permits use of readily available fuels.

Modernize your power plant with the installation of Erie City VC boilers. Moderate steam users everywhere are finding it economical. Bulletin VC-6 gives a full description of the many advantages of this unit.

You can depend on Erie City for sound engineering

ERIE CITY
114 Years in Steam Generation

ERIE CITY IRON WORKS • *Erie, Pa.*

STEAM GENERATORS • SUPERHEATERS • ECONOMIZERS • AIR PREHEATERS
UNDERFEED AND SPREADER STOKERS • PULVERIZERS

For more facts circle 512 on Reply Card

ORTON *Torque-Control** CRANES

THE MAN WHO OWNS ONE CAN TELL YOU

These firms are among those which have purchased ORTON *Torque-Control Cranes since the introduction of *Torque-Control** in 1951.**

Names in red have purchased MORE THAN ONE crane.

Heywood-Wakefield Co.
Conifer, N. Y.

Chevrolet—Janesville Div.
General Motors Corp.

Ft. Dodge Iron & Metal Co.
Des Moines, Ia.

International Creosoting & Const. Co.
Beaumont, Tex.

Purdue University
Lafayette, Ind.

Dierks Lbr. & Coal Co.
Process City, Ark.

Pacific Fruit Express
San Bernadino, Calif.

Public Service Co. of Ind.
West Terre Haute, Ind.

Chicago Hardware Fdry. Co.
North Chicago, Ill.

Standard Steel Works
Burnham, Pa.

Canadian National Ry.
St. Johns, Newfoundland

General Steel Castings Corp.
Eddystone, Pa.

Lone Star Steel Corp.
Lone Star, Tex.

Indianapolis Power & Light
Indianapolis, Ind.

Dominion Steel & Coal Corp.
Sydney, N.S., Canada

Sternoff Metals & Iron Co.
Seattle, Wash.

Empress Siderurgica Nacional de Paz de Rio
Bogota, Colombia, S. America

Lincoln Crushed Stone Co.
Joliet, Ill.

Corps of Engineers
U.S. Army

Bond Brothers
Birmingham, Ala.

Steel Sales Co. of Africa
Johannesburg, So. Africa

Altos Hornos de Mexico
Monclova, Coah., Mexico

Erie Railroad Co.

General American Transportation Corp.
Sharon, Pa.

Potlatch Forest, Inc.
Lewiston, Idaho

Chevrolet-Detroit Forge Div. of Gen. Motors Corp.

Army Transportation Corps

Ill. Slag & Ballast Co.
Chicago, Ill.

Santa Fe Railway

Reilly Tar & Chemical Co.
Lima, Ohio

Robinson Bros. & Co.
Chicago, Ill.

Calumet Steel Div.
Borg-Warner Corp.
Chicago Heights, Ill.

Transp. Research and Development Sta.
Ft. Eustis, Va.

Svenska Cellulosa
Essviks, Sweden

Wifstavarfs Aktiebolag
Vivstavarv, Sweden

Urania Lumber Co.
Urania, La.

Aliquippa & Sou. RR
Aliquippa, Pa.

Euclid Road Mchy. Co.
Cleveland, Ohio

Universal Concrete Pipe Co.
Baldwin Park, Calif.

Davie Shipbuilding & Repairing Co., Ltd.
Montreal, Que., Canada

Pt-A-Mousson
Paris, France

Kilby Steel Co.
Anniston, Ala.

Republic Creosoting Co.
Mobile, Ala.

Illinois Central RR. Co.

Smith & Caffrey Co.
Syracuse, N. Y.

NOW, All ORTON Cranes are equipped with *Torque-Control

*ORTON *Torque-Control*—Patent No. 2,628,470

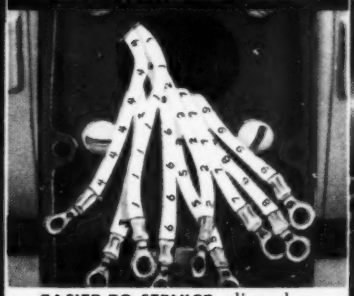
ORTON CRANE & SHOVEL CO.
608 SOUTH DEARBORN ST. • CHICAGO 5, ILL.

For more facts circle 513 on Reply Card

For more facts circle 514 on Reply Card →

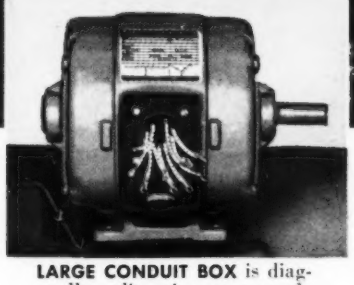
TRI 55 CLAD THE LEADER IN MODERN MOTOR DESIGN

PERMA-NUMBERED LEADS



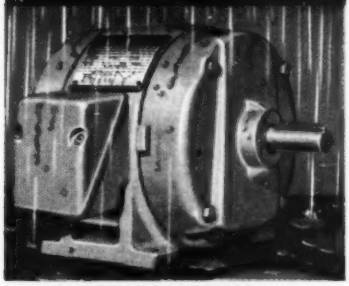
EASIER TO SERVICE, clipped or taped terminals always can be read. You save hooking-up time.

EASY ACCESS CONDUIT BOX



LARGE CONDUIT BOX is diagonally split—gives you ample knuckle room for easier wiring.

60% MORE PROTECTION



MORE FULLY PROTECTED motor achieved through redesign of cast iron frame and end shields.

LONGER MOTOR LIFE

NEW BEARING SYSTEM means the G-E motor runs longer without relubrication than any other.

Now, easier installation, less maintenance...

G.E.'s new TRI 55 CLAD motor—you can install it and forget it!

REG. U.S. PAT. OFF.

The all-new General Electric Tri/Clad '55' motor is specially engineered to reduce your installation costs . . . and run longer, without attention, than ordinary motors. This new motor gives you 60% more physical protection plus longer electrical life. In addition, a bearing system designed to use the most modern greases means you will not have to regrease the Tri/Clad '55' for years.

You save with the new Tri/Clad '55' because wiring is easier and faster. The large, diagonally split conduit box gives you plenty of knuckle room. Leads are perma-numbered . . . you can always identify them instantly.

The new Tri/Clad '55' also brings you important handling, storing and installing economies. Better use of space within the frame means a 30% reduction in size and weight in some ratings. Yet active materials (magnetic steel and copper) are not sacrificed.

General Electric Tri/Clad '55' motors are now available in many ratings. The complete line of 1 to 30 hp a-c motors will be available soon. For full details contact your G-E Apparatus Sales Office or G-E Motor Supplier today. Write for Tri/Clad '55' bulletins GEA-6013—Dripproof motors, GEA-6012—Enclosed motors, GEA-6027—Gear-motors. General Electric Company, Section 648-7, Schenectady 5, N. Y.

Progress is our most important product

GENERAL ELECTRIC

COMPARE FLOODLIGHT FEATURES

TYPE L-69

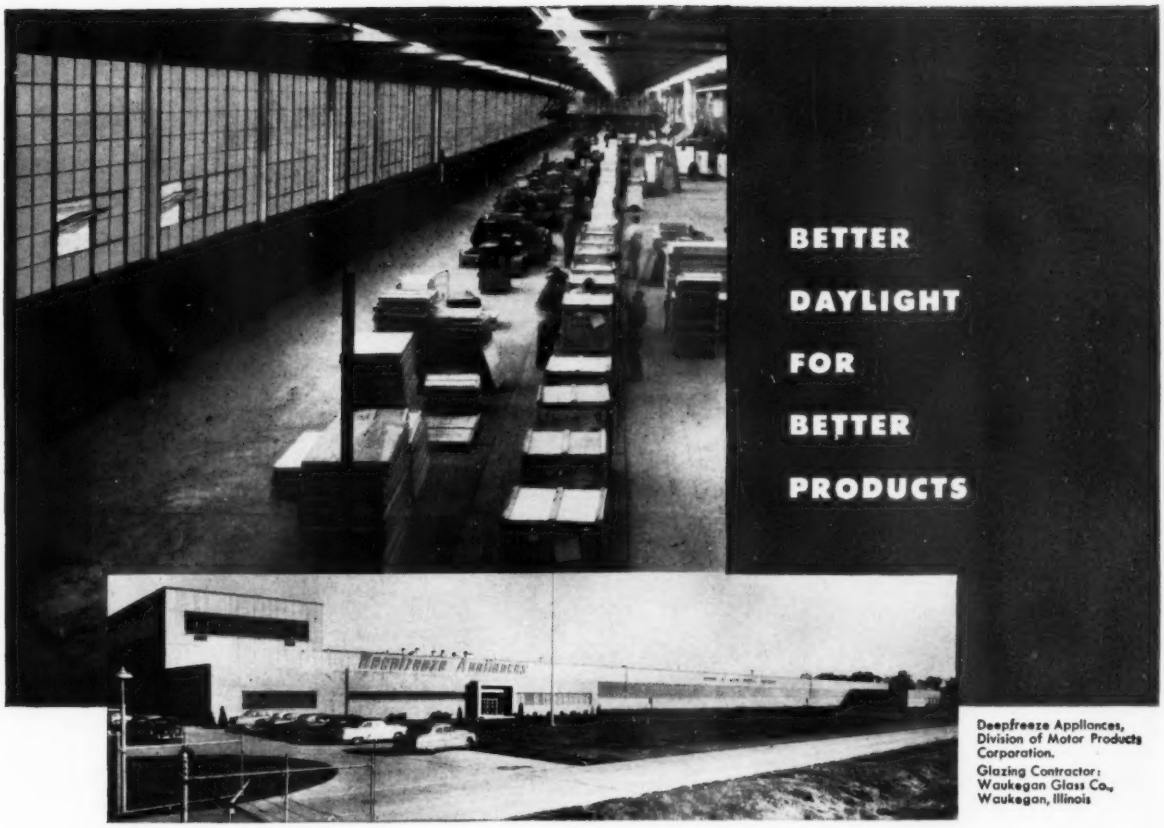
FEATURE	G.E. L-69	Mfr. A	Mfr. B	Mfr. C	Mfr. D
TEMPERED GLASS SPUN TO REFLECTOR Reflector stays cleaner	YES	YES	YES	NO	NO
ALL PARTS CORROSION RESISTANT Floodlight lasts longer	YES	NO	NO	NO	NO
RELAMPING FROM REAR More convenient—reduces breakage	YES	YES	NO	YES	NO
ACCURATE BEAM SIGHTS Makes aiming easier	YES	NO	NO	NO	NO
CABLE FURNISHED Faster installation—no extra costs	YES	YES	YES	NO	NO
SERVICED WITHOUT TOOLS Faster, easier maintenance	YES	NO	NO	NO	NO

Almost any floodlight will perform satisfactorily when new. Only a top quality light will maintain this performance. If you want a floodlight which is easier to install and service, and which maintains its high light output after years of operation, install the General Electric L-69 floodlight.

More information on the L-69 floodlight is available from your G-E Distributor, or write General Electric Co., Section 451-188, Schenectady 5, New York.

GENERAL ELECTRIC

For more facts circle 515 on Reply Card



Deepfreeze Appliances, Division of Motor Products Corporation.
Glazing Contractor: Waukegan Glass Co., Waukegan, Illinois

New Deepfreeze Plant Installs Coolite Glass To Eliminate Harmful Effects of "Raw Sunlight"

Deepfreeze, famous manufacturer of modern appliances for modern living, recognizes the importance of proper factory lighting to boost efficiency and employe morale. "Raw Sunlight" contains many factors that adversely affect your workers and their output. Excess solar heat makes interiors uncomfortable . . . and blinding glare makes seeing tasks difficult and tiring. This new Deepfreeze plant is glazed with 8000 square feet of Mississippi Coolite, Heat Absorbing, Glare Reducing Glass, which effectively controls the quality of light flooding work areas . . . banishes objectionable glare . . . cuts costly eye fatigue that results in seeing errors.

The Coolite in this modern plant is glare reduced on both sides, affording a maximum diffusion of light with a minimum of glare. Workers see better . . . feel better . . . work better in better light by Coolite.

If you are planning new construction or modernization, investigate Coolite. See how it can give you increased economy and efficiency. Call your nearby Mississippi Glass distributor today.

Send for free catalog, "Coolite Heat Absorbing and Glare Reducing Glass." Samples on request.

MISSISSIPPI Glass COMPANY

88 ANGELICA ST. SAINT LOUIS 7, MO.

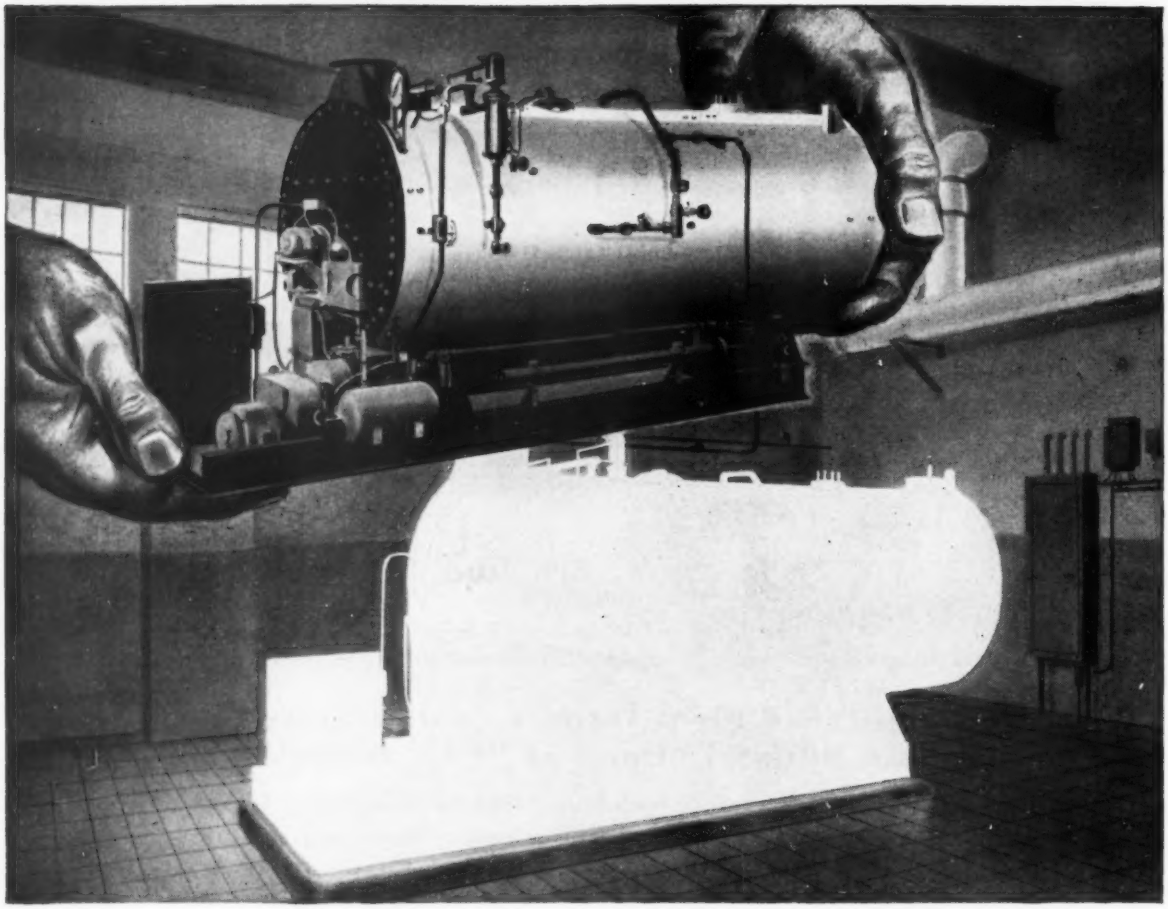
NEW YORK • CHICAGO • FULLERTON, CALIF.

see our catalog in ARCHITECTURAL FILE or write for copy

WORLD'S LARGEST MANUFACTURER OF ROLLED, FIGURED AND WIRED GLASS

For more facts circle 516 on Reply Card

Here's why you get more...when you buy a Cleaver-Brooks Self-Contained Boiler



...only Cleaver-Brooks can offer you the experience gained from more than 20 years of pioneering . . . and more than 12,000 individual "packaged" boiler installations

CLEAVER-BROOKS pioneering has been largely responsible for simplifying boiler buying . . . lowering costs of installation . . . delivering 80% guaranteed steam efficiency from every fuel dollar when firing with oil.

Boilers can be shipped as completely assembled and tested self-contained units, with auxiliaries as required. Installation involves minimum of time, construction and space. Usually connections only to steam, fuel, water lines and electrical service are needed. No special foundations are required. A short vent takes care of exhaust gases. Frequently, boilers are ready for use in a matter of *hours*, depending on availability of service lines.

Cleaver-Brooks, originators of the self-contained boiler, offers wider experience that counts in another important way. Qualified engineers help you plan steam plants tailored *exactly* for your needs. Carefully analyzed are loads, space and equipment arrangement. This not only helps you solve present steam needs, but adds flexibility for future expansion as well.

This application engineering, plus basically sound design and construction is your assurance of a full return from your boiler investment. When you specify a self-contained boiler — make sure it's a Cleaver-Brooks.

For more facts circle 517 on Reply Card

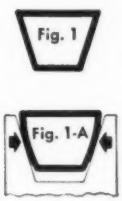
Send for Catalog AD-100 for full details on Cleaver-Brooks boilers. Available for oil, gas and combination oil/gas firing. Sizes 15 to 500 hp, 15 to 250 psi — for heating and processing.

CLEAVER-BROOKS COMPANY
Dept. F, 306 E. Keefe Ave.
Milwaukee 12, Wisconsin, U.S.A.

Cleaver-Brooks
ORIGINATORS OF THE SELF-CONTAINED BOILER
Steam Boilers • Oil and Bitumin Tank Car Heaters • Distillation Equipment Oil and Gas Fired Conversion Burners

This simple idea saves money in V-Belt Costs

You can prove it in two minutes!

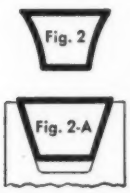


To prove how the CONCAVE SIDES of GATES VULCO ROPES *save money,* just make this simple test—

Bend *any* V-Belt that has *straight sides* (Fig. 1) and—as the belt bends—*feel* the sides *bulge out* (Fig. 1-A). This out-bulge concentrates the wear at the points shown by arrows—and this naturally shortens the life of a *straight-sided* belt!

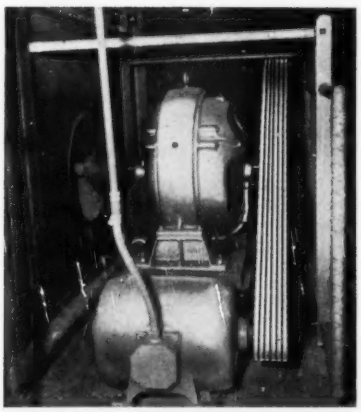
Now bend a Gates Vulco Rope with CONCAVE SIDES (Fig. 2)

(U. S. PAT. 1813698)



You find that the CONCAVE SIDES *fill out* and become perfectly straight. They thus press *evenly* against the V-pulley. All wear is distributed *uniformly* across the *full width* of the GATES VULCO ROPE—and this means *longer* belt *life* and *lower* belt *cost* for you!

When you buy V-Belts, be sure to get the V-Belt with the CONCAVE SIDES—the GATES VULCO ROPE!



Typical Gates Vulco Rope Drive—the Gates V-Belts are built with Concave Sides to insure longer belt wear.

VULCO ROPE DRIVES

THE GATES RUBBER COMPANY
DENVER, U.S.A.

Gates Engineering Offices and Jobber Stocks are located in all industrial centers of the United States and Canada, and in 70 other countries throughout the world.

CS-548

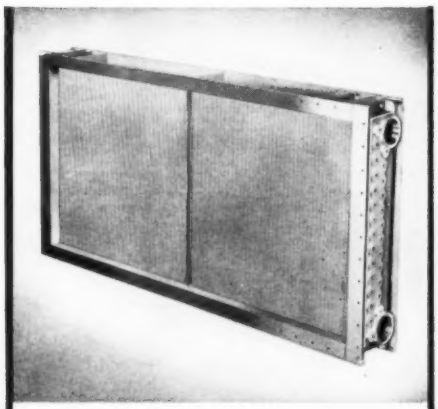
For more facts circle 518 on Reply Card

Simplify
Fill all your needs

one source,

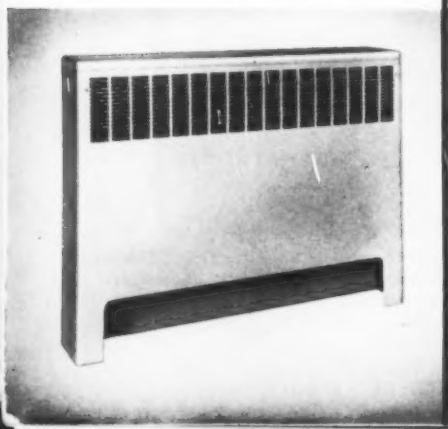
No need to shop around among a dozen suppliers—wade through oceans of catalogs—TRANE can supply just the equip-

For high ceilings TRANE Projection Unit Heaters have exclusive Louver Cone Diffusers that give up to 60% greater "distance of throw." Diffuser "steers" heat in any desired direction, gets it down to working levels for maximum comfort.



For "built-up" systems—TRANE Coils offer mechanical fin-to-tube bond that is as strong as the metal itself, gives greater heat transfer efficiency. Special steam coils with Kinetic Orifice guard against freeze-up. Coils with new Delta-Flo Fin have delta form that gives greater capacity to fin surface.

For offices, laboratories, stair wells, corridors, TRANE Convectors can be installed free-standing, recessed or wall-hung. Aluminum-copper heating element is more efficient, saves fuel. 11 cabinet styles with flat or sloping top. Convectors come assembled ready for fast installation.



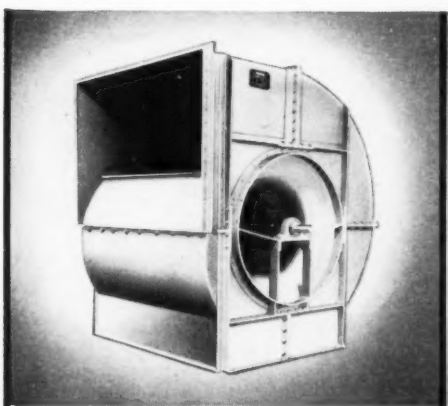
To offset negative pressure—for powered ventilation, TRANE Roof Ventilating Heater combines four functions in one unit—ventilates in summer, heats in winter, tempers outside and recirculated air, ends negative pressure and infiltrating cold drafts and dirt. Louver Cone Diffuser "beams" air where needed.

Wherever steam is used, TRANE Steam Specialties can save fuel, boost production. TRANE Float, Thermostatic and Bucket Traps get more heat out of steam. TRANE Lifetime Valve has lifetime guarantee against stem leakage. TRANE Vents stop air binding in risers and equipment. TRANE Strainers ideal for dirty lines.

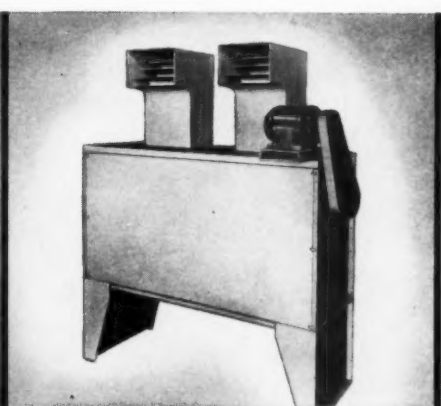
heating system checkup! from the complete Trane line!

one responsibility . . .

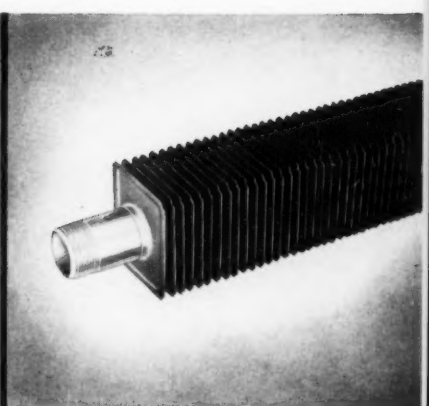
ment you need—concentrate responsibility in *one* reliable source. Make it easy—make it a "one-order" job. Call your nearby TRANE Sales Office, or write TRANE, La Crosse, Wis., for complete information.



For moving air, TRANE Fans have lower hp requirements, save power. Streamlined fan inlet cone assures even air distribution in fan wheel, eliminates noisy, power-wasting turbulence. Split fan housing permits biggest fan to pass through small openings for easy installation. FC and BI fans available to 330,408 cfm.

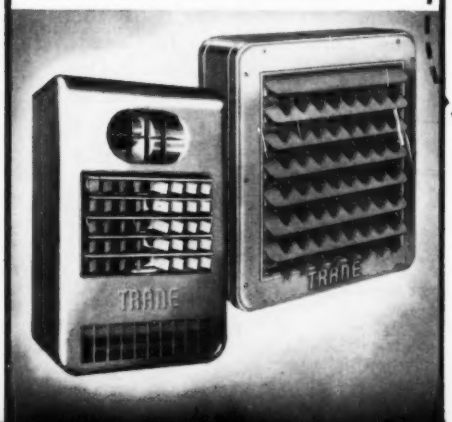


For space heating and ventilating, TRANE Torridors with powerful centrifugal fans, 20 nozzle arrangements, distribute filtered, warmed air over large areas. Can deliver air through ducts to smaller rooms, hold accurate temperatures for process applications. Ideal for shipping docks. Use for summer ventilation too.



To stop drafts from skylight, walls and windows, TRANE Wall-Fin fits in where other types of radiation can't. Resists factory abuse, vibration. Heavy-gauge enclosure available where looks are a factor. Hanger is designed to permit coil expansion and contraction.

To put heat where you want it, TRANE Horizontal Unit Heaters with exclusive Louver Fin Diffusers can give divided streams, gentle blanketing or spot throw. Steam models have coils with permanent *mechanically bonded* fin and tubes. Gas-fired units have boiler-type heat exchanger . . . no gaskets, no furnace cement.



one source • one responsibility

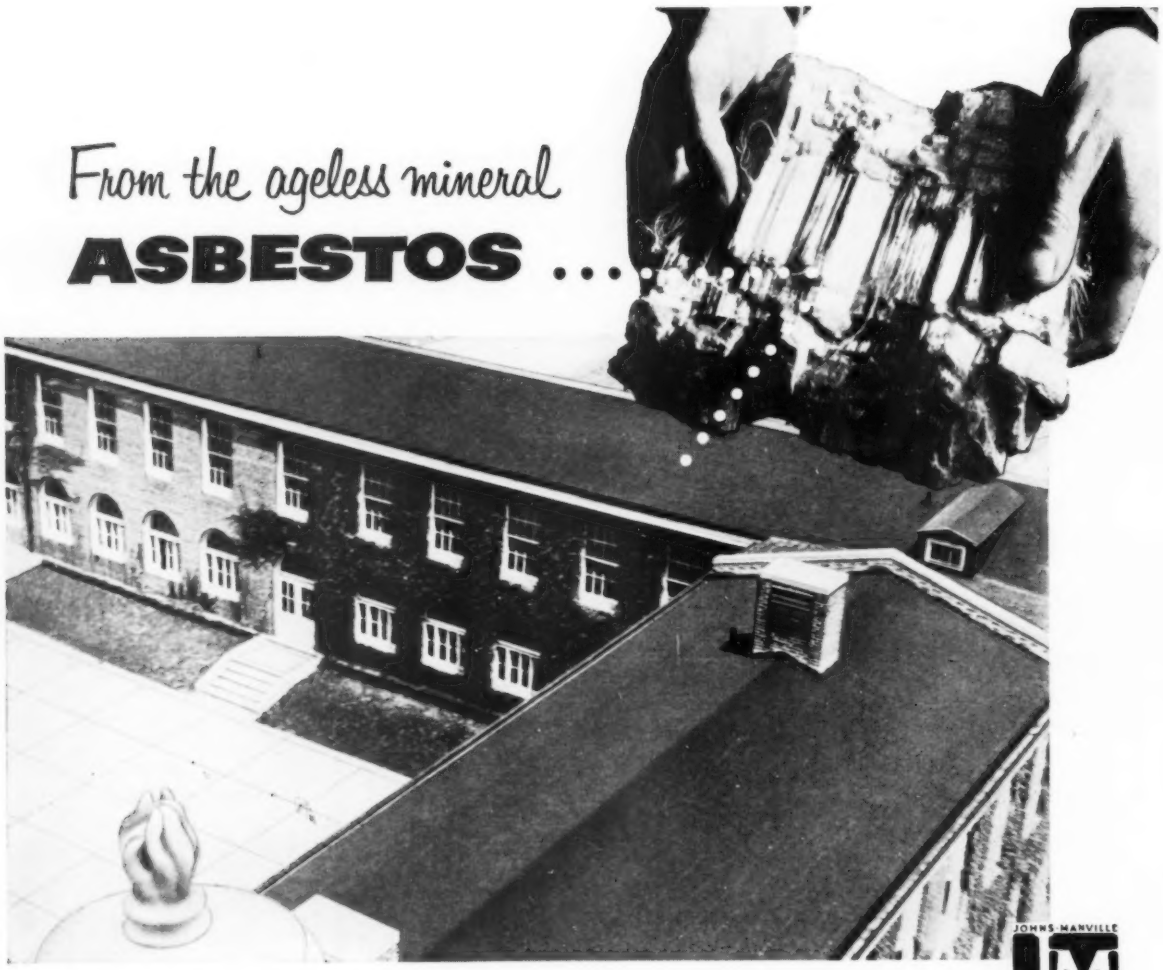
TRANE

MANUFACTURING ENGINEERS OF AIR CONDITIONING, HEATING, VENTILATING AND HEAT TRANSFER EQUIPMENT

The Trane Company, La Crosse, Wis. • East. Mfg. Div., Scranton, Penn. • Trane Co. of Canada, Ltd., Toronto • 90 U. S. and 14 Canadian Offices

From the ageless mineral

ASBESTOS ...



JOHNS-MANVILLE

JM

PRODUCTS

comes

the smooth-surfaced built-up roof- **FLEXSTONE***

which provides a flexible covering of stone

Because they are made of the mineral, asbestos, the felts of a Johns-Manville Flexstone Built-Up Roof assure lasting service and protection. They will not support combustion. They effectively resist the drying-out action of the sun . . . won't rot, are weatherproof and need no periodic coating.

Flexstone Built-Up Roofs are smooth-surfaced . . . permit thorough drainage . . . make damage easy to locate and repair. These superior advantages are also provided by the J-M Flexstone Special Built-Up Roof . . . developed especially for dead-level decks.

For complete information about Flexstone Roofs and J-M Asbestile* Flashing System that provides thorough water tightness and effective treatment for critical roof areas, see your Approved Johns-Manville Contractor. He's listed in the Classified Section of the telephone directory. Or send for folder BU-51A. Write Johns-Manville, Box 158, New York 16, N. Y. In Canada, write 199 Bay St., Toronto 1, Ont.

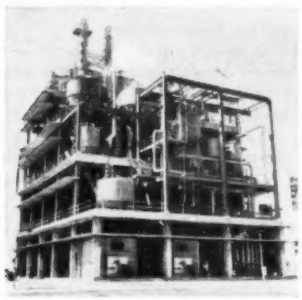
*Reg. U. S. Pat. Off.

Johns-Manville FLEXSTONE* Built-Up Roofs

ASBESTOS CORRUGATED TRANSITE* • ACOUSTICAL CEILINGS DECORATIVE FLOORS • MOVABLE WALLS • ETC.

For more facts circle 520 on Reply Card

CORN AND RUST DON'T MIX



For solid corrosion prevention and vaporsealing tips write us for a reprint of the "Chemical Processing" article mentioned.

Many are the marvelous products made from corn at the Corn Products Refining Company's Bluebonnet Plant. It, too, like other industries in the area, has maintenance problems, for it is situated on the salty coast of Texas with its corrosive atmosphere. An article in "Chemical Processing" for January 1954 revealed that this plant has met its corrosion problem by coating nearly all steel structures and equipment with INSUL-MASTIC.

This same protection can be used in your plant. INSUL-MASTIC's *Superior* heavy asphalt coatings will stop moisture, acids, alkalis and other corrosive agents. They also vaporseal insulation, and a special, cork-filled coating will act as an insulation itself while it prevents rust. Steel mills, chemical plants, refineries and others are using INSUL-MASTIC for lasting protection. It's the rugged, heavy duty guardian of steel and insulation. Let us send you the name of your nearest applicator. Write today.

Insul-Mastic

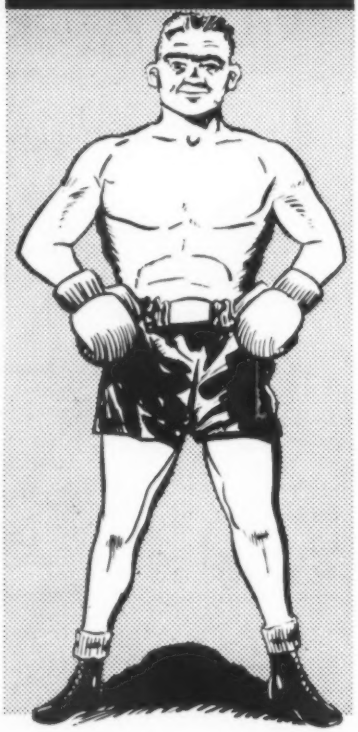
think first of the coatings that last!

Representatives in Principal Cities

CORPORATION OF AMERICA • OLIVER BUILDING, PITTSBURGH 22, PA.

For more facts circle 521 on Reply Card

ALL COMERS!



HERE'S THE CHAMP...

YOU SUPPLY THE CHALLENGER

The difficult fluid, gas, or air transmission problem in your plant—We'll send you a Snap-Tite Hi-Flow quick connect disconnect coupling—double or single shut-off or straight-thru—any size ⅛" to 3"—Test it! in your Plant, under actual working conditions—You be the judge—If it doesn't do a better job than the coupling you're now using—Or solve your problem—Ship it back collect! Fair enough? Write today on your letterhead, briefly outlining your problem—We'll ship immediately.

Snap-tite INC.

201 S. WOODBINE UNION CITY, PENNA.

For more facts circle 522 on Reply Card

BACKTALK about our past issues

Edited by R. L. Marinello

Plans Maintenance Department

PLANT ENGINEERING:

"In looking through my file of PLANT ENGINEERING issues, I came across an article entitled 'How Necco Plans Its Plant Engineering.' This appeared in the April, 1952, issue and it was mentioned that reprints were available.

"I realize that this article appeared some time ago, but as I am now in the process of organizing a maintenance department of some 120 men, I would appreciate obtaining this reprint, if possible.

"In the event you have other articles along these lines which would help resolve this problem, I would appreciate your sending them to me. *Roger A. Kelsey, Plant Engineer, Texfoam Div., The Sponge Rubber Products Co., Shelton, Connecticut.*

► The Necco article along with tear sheets of several other articles which were published in recent issues of PLANT ENGINEERING are being sent to you. We hope this material will be of value to you in your maintenance department organization.—*Editors.*

Teacher's Helper

PLANT ENGINEERING:

"We were impressed with the article written by Mr. E. P. Stahl, entitled 'Which Bearing for Which Service?' appearing in the February, 1954, issue.

"Is it possible for us to obtain ten reprints of this article for our Foreman Training Program? We would appreciate it very much if you could forward these copies to us." *A. W. Kissner, Plant Engineer, Ford Division of Ford Motor Co., Richmond, California.*

► We are happy to make these reprints available to you with the compliments of the editorial department.—*Editors.*

Felt Thickness

PLANT ENGINEERING:

"The article 'Felt Doubles as Mountings and Isolators,' in the March, 1954 issue was very interesting.

"There is, however, one correction I would like to make. In the article at the top of page 89, you go into quite a bit of detail on loading pressures and thicknesses recommended. I am sure you obtained the information for this article from many sources; however, our recommendations differ quite a bit from those mentioned.

"I am attaching one of our engineering data sheets showing our recommended loadings, and you will notice that we are apt to recommend any one of three thicknesses regardless of the loading.

"The thickness of the material is dependent upon the type of machine and the action of the machine in its operation. For example, a punch press, weighing 6500 lb, would undoubtedly use 1 in. thick material. However, a cold heading machine with equal weight would use ½ in. thick material because the cause of vibration is on an entirely different plane. It is horizontal whereas the punch press works in a vertical direction." *P. N. Wheeler, Manager, Unisorb Division, The Felters Co., Boston, Massachusetts.*

Interested in Nomographs

PLANT ENGINEERING:

"The Industrial Reference Division of the Department of Engineering Research of this institution publishes a periodical titled *Engineering Review.* It is circulated primarily to industries and other interested individuals and organizations in the state of Pennsylvania.

"This is written to request your permission to include in the publication from time to time a copy of one of the very excellent nomographs which you publish in your magazine." *George L. Thuering, Associate Professor, Industrial Engineering, College of Engineering and Architecture, The Pennsylvania State College, State College, Pennsylvania.*

► You are most welcome to use any of the nomographs which you feel will be of help to your readers. In fact, if you should care to have the artwork at any time, just let us know.—*Editors.*

Dry Type Transformer Survey

PLANT ENGINEERING:

"I recently saw a reference to an article in your magazine where you mailed a number of questionnaires to users of dry type transformers.

"Could you favor me with a copy of the results received from these questionnaires?" *Lyle J. Hicks, Dongan Electric Mfg. Co., Detroit, Michigan.*

► The results of this survey were published in the article "Dry Type Transformers Safe, Reliable and Flexible, Survey Says," in the October, 1953, issue of PLANT ENGINEERING, pp 84-87. A copy is being sent to you—*Editors.*

March Issue Most Helpful

PLANT ENGINEERING:

"We would greatly appreciate additional information about the new Paint-On Zinc Coating which checks rust and which is referred to in the March 1954 issue of PLANT ENGINEERING.

"Also in the same issue is an article entitled 'Selection, Use and Care of Tools.' This would be very helpful, I believe, for my foremen to use as an instruction sheet for their men in one of their weekly safety and instructional meetings. Would it be possible to obtain seven tear sheets of this article?

"Also in the same issue is an article

BETZ • *A Great Name In Water Conditioning*

Meet your V.I.P.

The Betz Sales Engineer, a *Very Important Person?*

We think so.

With his experience and full knowledge of water conditioning, and with the facilities of the *entire* Betz Organization to assist him, he is ready to step in and recommend ways and means to achieve more efficient, economical plant operation through proper water conditioning.

It's his job to work shoulder to shoulder with you and your operating level personnel . . . assist in setting up correct systems of control . . . keep you fully abreast of the latest developments in Betz water conditioning technique . . . and a host of other services, from "trouble-shooting" to being a real part of your team.

Chances are, a Betz Sales Engineer can be the most important visitor you may receive today. Let him tell you how Betz *completely-integrated* water conditioning service can help you with your problem that's "different". You'll be glad you did.

W. H. & L. D. BETZ, Gillingham & Worth Streets, Philadelphia 24, Pa. In Canada: BETZ Laboratories Limited, Montreal 1.

BETZ

CONSULTANTS ON INDUSTRIAL WATER PROBLEMS

For more facts circle 523 on Reply Card

DOWNRIGHT DEPENDABLE

VARIABLE-SPEED CONTROL

THE LEWELLEN DOUBLE-BLOCK, UNITIP BELT—keeps tension at a minimum on belt, bearings, and shafts. Contoured lateral blocks are bolted and riveted to an impregnated, plied belt body at closely spaced intervals. Lightweight splice plates are pinned, riveted, and cemented to belt ends. Pin heads interlock with mating splice plates to form a strong, compact splice. Assembled belt is machined and single tips are cemented and pinned to block ends. Here is what it takes in a belt to give dependable performance under all load conditions.

AND THESE DISTINCTIVE FEATURES—FLEXIBLE LEVER & LINK SUSPENSION . . . thrust bearing load equally distributed on every ball in the bearing, at all speeds and positions, and while changing speeds. SIMPLE, POSITIVE LUBRICATION SYSTEM for disc hubs, keys, and shaft.

if it's variable-speed control . . . look to

LEWELLEN

TRANSMISSIONS • MOTOR PULLEYS

Open or enclosed, vertical or horizontal Variable-Speed Transmissions in all sizes from fractional h.p. to 60 h.p. . . . Variable-Speed Motor Pulleys in all ratings from fractional to 7½ h.p. Speed range, 3 to 1 for all pulley sizes. (One size—2¾ to 1.)

Service in variable-speed control exclusively for more than 50 years. May we help you?

LEWELLEN MANUFACTURING CO.
COLUMBUS, INDIANA

For more facts circle 524 on Reply Card

BACKTALK

'Refrigeration Condensers—How They Operate, How They're Maintained.' If they are available two copies of this would be very helpful as we would like to give them to our refrigeration men for study and use.

"Also on page 105 of the same issue is an article on 'Tool Leasing.' In this article you mention that a Milwaukee manufacturer, Kearney and Trecker Corp., has announced tool leasing as a part of their sales program. Could you tell me at this time if there are any other machine tool companies that have incorporated this idea into their sales program and if so who they are." *W. H. Godshall, Plant Engineer, Playtex International Latex Corp., Dover, Delaware.*

▶ You will receive tear sheets of the articles you mentioned. We are also forwarding your name to the manufacturer of ZRC for more information on the zinc coating article.—*Editors.*

Lift Trucks and Cost Control

PLANT ENGINEERING:

"In the January, 1954, issue, we noted the following articles: 'Effective PM Program for Industrial Trucks' and 'Cost Control.'

"We are anxious to obtain three copies of each of these articles. We want to distribute them in our organization so that they can be used by our people." *J. C. Malloy, Master Mechanic, Armour and Co., Kansas City 18, Kansas.*

More Info on Zinc Coating

PLANT ENGINEERING:

"Kindly send more information on paint-on zinc coating as written in the March, 1954, issue.

"We are looking for a coating that we could use in our 16 gal tanks that would withstand alkali and caustic solutions.

"Any additional information on coating aluminum for this purpose would be greatly appreciated." *Matthew J. Nowak, Midwest Eng. Co., South Bend, Ind.*

PLANT ENGINEERING:

"We would like to obtain information about ZRC as recently printed in the article 'Paint-On Zinc Coating Checks Rust' in your March, 1954, issue.

"We would also appreciate any information that might be available regarding the cost of application." *John Grill, Purchasing Division, Crown Zellerbach Corp., Port Angeles, Washington.*

▶ More information on this product will be forwarded to you from Mr. C. Alfred, Sales Manager, The Sealube Co., 14 Valley St., Wakefield, Mass.—*Editors.*

Balloons Reduce Oil Loss

PLANT ENGINEERING:

"I was very interested in the item 'Blanket of Tiny Balloons Reduces Oil Loss' which appeared in the 'Plant Engineers' Digest' section of the February, 1954 issue.

"If at all possible, I would appreciate receiving more information on these microscopic balloons." *M. Glass, Engineer, Caltex, Ltd., New York 17, N. Y.*

▶ Information on these Microballoons originated with the Bakelite Co., Div. of Union Carbide and Carbon Corp., 260 Madison Ave., New York 16, N. Y. Additional data on this process may be obtained from them. You may also wish to contact Standard Oil of Ohio, Midland Building, Cleveland 15, Ohio, since they did the development work on these spherical particles.—*Editors.*

Liked Bearing Article

PLANT ENGINEERING:

"In your February, 1954 edition, you have an article which attracted our attention. This article is titled 'Which Bearing for Which Service?' and it was written by Mr. E. P. Stahl of the Garlock Packing Co., in Palmyra, New York.

"I have been fortunate in reading some of Mr. Stahl's previous articles and I enjoyed reading this article very much. I would like to obtain, if I possibly can, fifty copies of this article for distribution to the men in our organization." *W. C. Thompson, General Sales Manager, Detroit Ball Bearing Co. of Michigan, Detroit, Michigan.*

Request of a Request

PLANT ENGINEERING:

"I note that in Mr. D. Overland's letter in the 'Backtalk' column for January, 1954, he requests copies of pipe sizing tables which appeared on pages 92 and 93 of the October, 1953 issue.

"Would you be good enough to supply me with two copies of these tables? I am sure I will be able to make excellent use of them in my work." *George D. MacMillan, Project Engineer, American Cyanamid Co., Bound Brook, New Jersey.*

Industrial Lighting Reprint

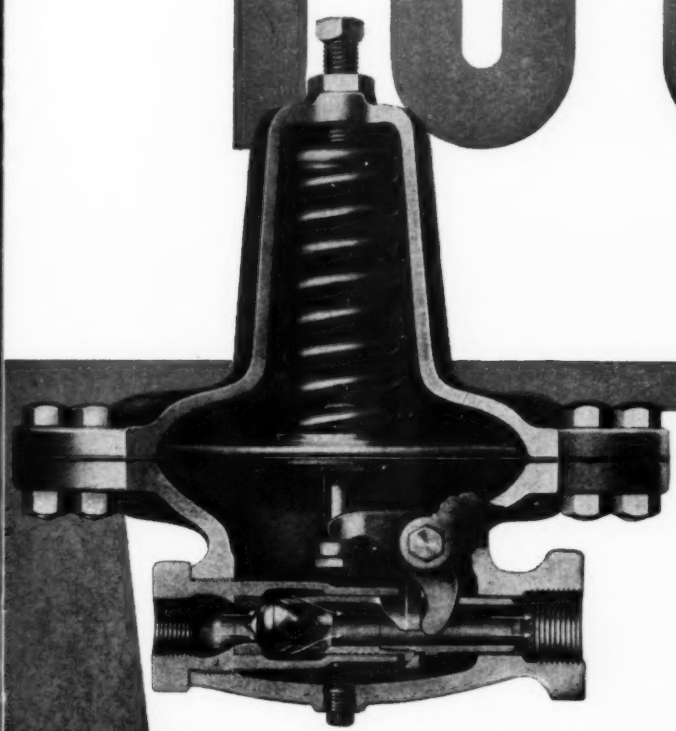
PLANT ENGINEERING:

"In the December, 1953 issue, I read the twelfth article in the series on industrial lighting and noted that reprints of the series would be available early this year.

"We have had considerable discussion about means of improving lighting efficiency and think this will help. *R. G. Dye, Mill Engineer, Canadian International Paper Co., Montreal, Quebec, Canada.*

For more facts circle 525 on Reply Card——▶

TYPE 1000 VALVE



Any product of quality should be dependable when *ordinary* products fail. Sudden pressure fluctuations, dirt, scale and viscous matter prove "fatal" to ordinary pressure reducing valves.

The CASH STANDARD TYPE 1000 VALVE however, is designed to operate with complete dependability under the most difficult and unusual circumstances. Many of these units have been in service over 10 years and have never been taken "out of the line."

Truly an *EXTRAORDINARY* achievement of quality and design excellence.

INSTALL CASH STANDARD "TYPE 1000" VALVES

CASH STANDARD **DECATUR, ILLINOIS**

A. W. CASH COMPANY

PLANT ENGINEERS' DIGEST so those who rush may read and know what's new

Edited by E. B. Skubik

Speedy Spline Finishing

CONFRONTED with a job that called for production of a spline with alternating thick and thin steps on the longitudinal faces of the teeth on the main drive shaft for a 6 by 6 truck, a leading automotive supplier found the answer to its problem in a setup using a rack shaver with special tooling. Purpose of the thick and thin sections in the 17-tooth spline is to help the mating gears stay in mesh despite angular thrust of a helical gear.

Two factors had to be considered in selecting the type of equipment. First, all the shaved portions had to be squared off at the corners and go the full depth of the teeth. Second, the time required to do the job had to be held to a minimum in order to keep costs in line.

On both counts the rack shaver proved to be the answer. No other method could achieve the desired form completely and, timewise, it was impossible to come close to the two minutes machining cycle of the rack shaver. Other shaving methods would have taken as long as 30 minutes.

Work rack on the right of table is offset with master rack while making cuts

Shafts being shaved are either SAE 8620 or 4620 steel. Involute spline teeth are hobbed with a relief at the root, enabling stock that is being removed in shaving to break free without danger of chips loading up at bottom of tooth and damaging the blades.

To machine the involute spline on the main drive shaft, the shaft is assembled with a master gear. The sleeve of the master gear slips over the threaded end of the main drive shaft. A nut placed over the threaded end holds the sleeve securely in place.

Since the relationship of the master gear to the spline being shaved is of considerable importance during the machining operation, a loading fixture is provided. The shaft and master gear assembly are placed into the loading fixture loosely assembled and the teeth of the spline to be shaved fit into mating locating teeth in the fixture. The master gear is precisely located in relation to the spline by means of a ground hole. A locating pin slides into this hole and the two components are aligned for machining. The clamp-

(Continued on page 32)

On the Ground and Overhead, Lift Bridge Permits the Passage of Freight

KELLY AIR FORCE BASE, San Antonio, Texas Air Material Area, receives from 30 to 50 carloads of supplies daily. These have to be unloaded, inspected, segregated and stored. Physical inventory at this place comprises several hundred thousand items.

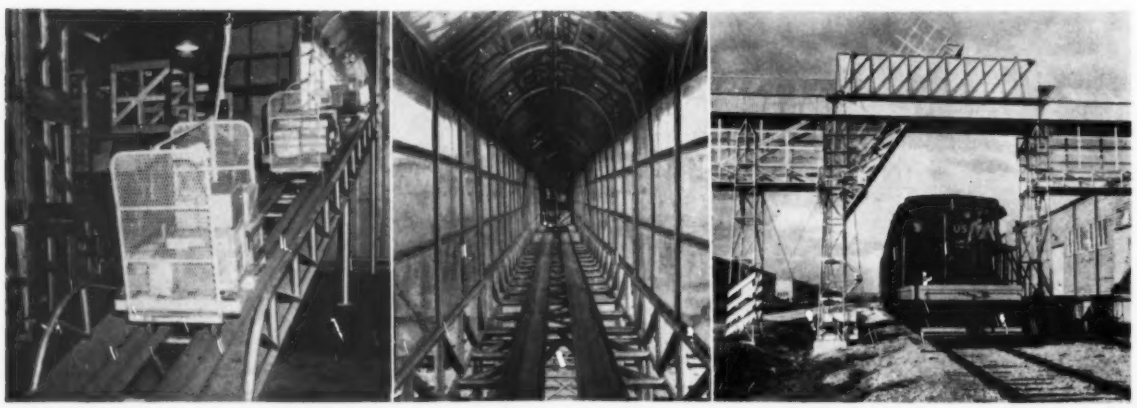
In its extensive and flexible handling system truck-tow overhead trolley conveyors are employed for moving dollies of freight.

During its travel, the North Kelly conveyor crosses railroad tracks in two places—on overhead enclosed bridges. Height of the floor of conveyor bridge is 14½ ft above tracks.

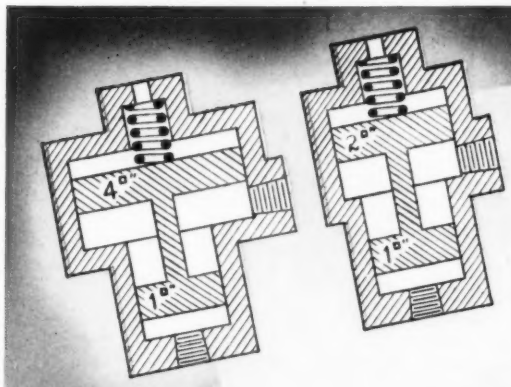
This height was restricted by the allowable maximum safe inclination of approaches for dollies or trucks—up from floor level of one line of warehouses and down to floor level of a second line of warehouses along the way.

There is, however, an interesting hinged, power-operated lift section, engineered by the Base, which can be raised to provide the necessary additional clearance, total 23 ft, when an engine with its train of cars must pass under the bridge.

This hinged section, built with metal tubing, corrugated roof and plastic windows like the rest of the bridge, has a hinged roof section and a split floor, so that the floor with its dolly or tow truck runways can be raised alongside and above the conveyor chain and the stationary I-beam track on which the conveyor trolleys run. The roof opens out from its ridge. *From Link-Belt News, published by Link-Belt Company, Chicago, Illinois.*



At left, dollies of freight from warehouse shelves are pulled up incline by a truck-tow conveyor, then travel through covered bridge crossing railroad tracks, center. Hinged section of bridge, at right, affords trains passageway beneath



Do You Know Why 'HIGH RATIO' TRAPS by NICHOLSON DRAIN CONDENSATE FASTER?

IF you were asked, "Which of the two differential pistons sketched above will require the least pressure drop before the piston assembly can move up?" you would obviously answer, "The one at the left". Because of the higher ratio between the areas of its upper and lower pistons.

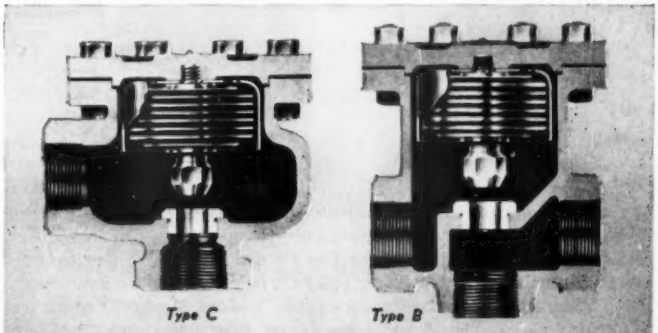
Now the line pressure in a thermostatic bellows trap is analogous to that in a differential piston. The higher the ratio of bellows area to discharge orifice area the less the pressure drop required before the bellows will contract and open the discharge valve.

Getting down to cases, the Nicholson thermostatic trap has a larger bellows than any other trap of this type, while its discharge valve orifice is approximately equal in size to any other trap. This gives a higher ratio and causes the Nicholson trap to operate on the least temperature difference between steam and condensate.

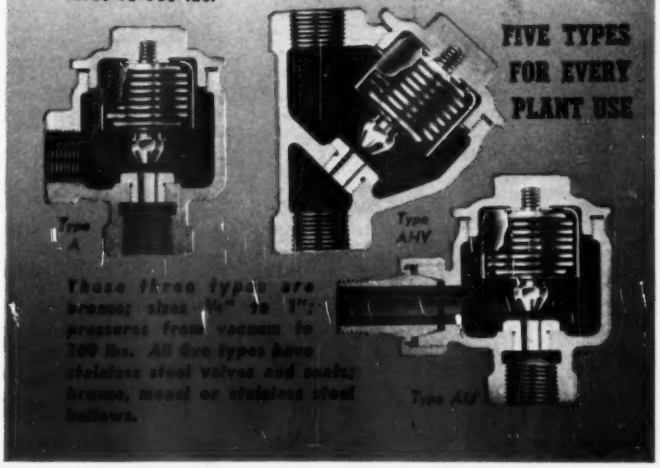
Now take the case of two traps with discharge valves of equal size and assume that they are operating at a given temperature difference.

The Nicholson "High Ratio" trap will open its valve wider and have larger capacity than the low ratio trap.

This is a reason why a Nicholson thermostatic trap operates faster and keeps a unit full of live steam. And, may we add, it's one of the advanced features that are influencing plant engineers increasingly to standardize on Nicholson.



The two types above are semisteel; sizes ½" to 2"; pressures from vacuum to 250 lbs. Type C also in cast steel for pressures to 300 lbs.


FIVE TYPES FOR EVERY PLANT USE
Type A
Type AHV
Type AU
These three types are bronze; sizes ½" to 2"; pressures from vacuum to 300 lbs. All five types have stainless steel valves and seats; bronze, monel or stainless steel bellows.

Send for NICHOLSON TRAP CATALOG 953

Catalog 953 contains capacity tables, installation diagrams, and data, charts and formulae for determining the proper size trap.

W. H. NICHOLSON & CO.

208 OREGON ST., WILKES-BARRE, PA.

Sales and Engineering Offices in 53 Principal Cities

For more facts circle 526 on Reply Card

PLANT ENGINEERS' DIGEST

(Digest begins on page 30)

ing nut is then tightened and the assembly placed between centers for machining.

As work progresses through the shaving cycle the master rack is offset relative to the shaving rack resulting in a progressive removal of metal. Control of the amount of metal removed is automatic, being a function of the hydraulic circuit at the back of the machine. About 0.0015 to 0.002 in. of metal is removed in the first pass with about 0.0005 in. removed in the final pass. *From a release of Michigan Tool Company, Detroit, Michigan.*

"Party-Line" Crane Operators

IT IS LIKELY that nobody has ever dared to estimate the amount of walking or shouting done on the open hearth floor of a steel mill, in producing one ton of steel. But operating executives of U. S. Steel's new ultra-modern Fairless Works have adopted a new communications system by which men on the hot metal runway and on the pouring floor can talk to overhead crane operators without raising their voices or chasing the rumbling cranes through the ½-mile-long building.

Delays in use of valuable crane time, and the nervous and vocal strain imposed by old-style "walking and yelling" communication with the crane operators, are practically eliminated with a two-way frequency-modulated (FM) carrier communication system, now operating along both the charging and pouring sides of the nine open hearth furnaces.

To give instructions to a crane operator the first helper or other ground-floor personnel need only step to a wall-mounted Telecrane station and talk into the microphone. The receiver is always on "stand-by" and he can key the unit for transmitting to communicate with the man on the crane.

Similarly the unit in the crane cab comprises both transmitting and receiving apparatus — a wall-mounted loudspeaker, and a ceiling-mounted microphone adjusted to the level needed for the crane operator. A foot switch on the floor of the crane cab permits the crane operator to key the unit to transmit.

Two-way radio system allows the crane operator talk easily with floor crew

The Telecrane transmits FM carrier waves over existing electrical circuits; no additional wiring is needed.

(Continued on page 38)

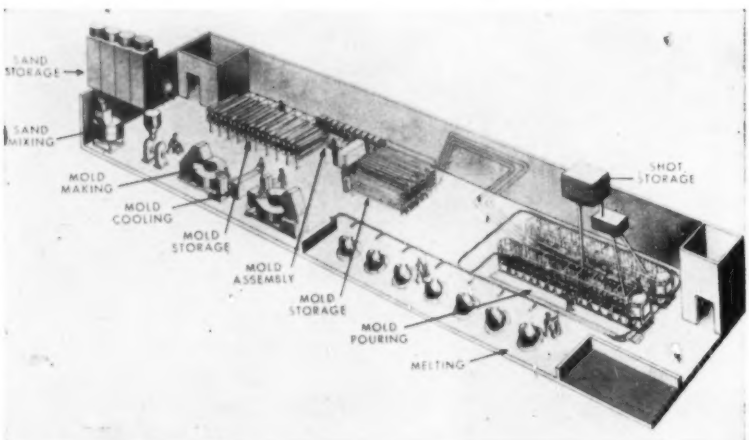
Automatic Shell Molding Machine Heart of Modern Mechanized Foundry

NEW MECHANIZED BRONZE FOUNDRY, built around an automatic shell molding machine capable of producing 240 molds an hour, provides economies in production, operation and clean, safe working conditions.

Machinery designed and developed by Walworth Company for its new Boston, Mass., bronze foundry includes sand and resin mixers, the shell molder, mold assembly, melting, and pouring equipment integrated by extensive conveyor system.

The automatic shell mold making machine accommodates eight patterns at a time and produces a complete shell mold every 15 seconds. The shell molding process employs only a thin layer of sand bonded by phenolic resins to reproduce a casting pattern. The porous nature of the shell mold results in less metallurgical difficulty and less foundry loss. Castings made from shell molds have a smooth finish, can be held to close tolerances and require less machining to finish.

The new mechanized shell molding system replaces a green sand bronze foundry and is adapted to mass production of valves, threaded pipe fittings, pipe flanges and other products cast in bronze, carbon steel, stainless steel, aluminum, brass or other alloys. The shell molding system requires less space to produce the same amount of castings as the old green sand foundry.



View of mechanized bronze foundry built around automatic shell molding machine. Extensive conveyor system integrates all operations, speeds production

The rotary mold-making machine automatically controls eight stations which can accommodate eight mold patterns at one time. Three stations pre-heat the pattern, one station pours the resin-sand mixture on the pattern, three more stations cure the mold and at the final station the completed shell mold is automatically ejected.

Two halves of a mold are joined in an automatic mold-closing machine after cores are inserted and adhesive applied. Completed molds are sent by conveyor system to automatic storage racks or direct to the pouring machine. A continuous-belt pouring machine, where the mold is cast, travels at about six feet per minute on a monorail conveyor. Pouring ladles suspended from a monorail, with a 200-lb capacity, fill an average of 12 to 16 molds with molten metal. A shakeout conveyor separates mold from casting.

Costs of cleaning the finished casting are substantially reduced by the use of the shell molding process. *From a release of Bakelite Co., Div. UCC, New York, New York.*

THESE 3 SUN GREASES WILL DO 95% OF YOUR GREASE LUBRICATION JOBS

—save you the cost and trouble of stocking a large number of "special purpose" greases

FIBROUS • Sun Grease 844X

Has exceptional oxidation stability under high temperature conditions. Recommended for all antifriction bearings. A general-purpose, high melting point lubricant for pressure gun and grease cup application.

BUTTERY • Sun Grease 300A

Especially designed for pressure lubrication of bearings operated at normal speeds and temperatures. Can be used in pressure guns, compression grease cups, or pressure lubrication systems. Has high water resistance and excellent pumpability at low temperatures.

TACKY • Sun Grease 897

For open gears, chains, slides, cams, linkages and bearings. Used whenever "throw-off" must be avoided. High adhesive and cohesive characteristics. An excellent lubricant that is water resistant and does not need frequent application.

Of the 81 different Sun greases, these three can fill the vast majority of your needs. And lubrication simplification like this means worth-while economies for you in several directions. You can reduce the total amount of money you need to "invest" in lubricants. You can greatly lighten the housekeeping job of storing and handling your greases. And you can reduce the confusion and risk of error often created when personnel are required to choose from a large number of greases.

For lubrication points that do require special kinds, Sun offers a total of 78 other greases with a wide range of properties and characteristics.

Find out just how much you can economize by using Sun lubricants. Call in your Sun representative. Or write for information. Dept. PY-5.

INDUSTRIAL PRODUCTS DEPARTMENT

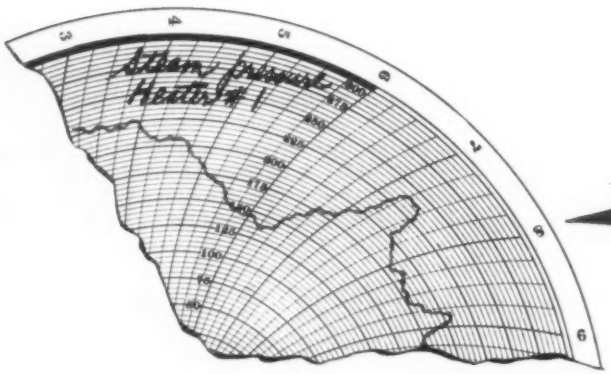
SUN OIL COMPANY

SUNOCO®

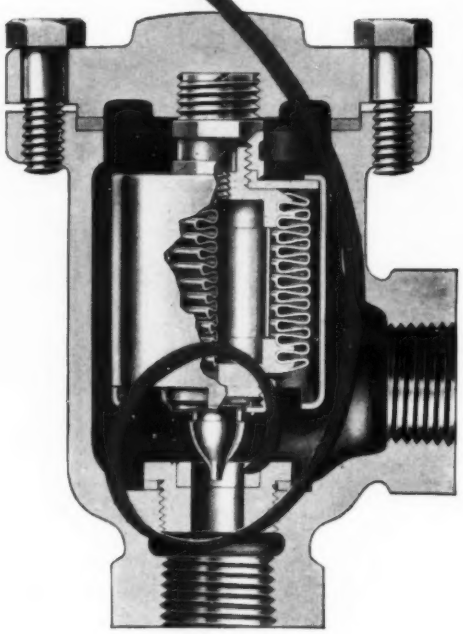
PHILADELPHIA 3, PA. • SUN OIL COMPANY LTD., TORONTO & MONTREAL

Refiners of famous High-Test Blue Sunoco Gasoline

For more facts circle 527 on Reply Card



Same size seat and head for all pressures to 300 psi!



Is this your steam TRAPPING PROBLEM...

Changing seats and heads for varying loads or pressures to 300 psi?

HERE'S HOW to select the right trap!

First thing to do is to define exactly what you expect the trap to do—and then select 1 of the 5 *different* types best suited for the job on hand. If you need a trap with *one or all* of the following characteristics, then the Sarco Thermostatic Trap is your best bet.

1. No changing of seats and heads for varying loads or pressures to 300 psi . . . the thermostatic element is *self-adjusting.*
2. High capacity with small size (¾" trap fits palm of hand) . . . offers greatest capacity per dollar cost.
3. Large capacity air venting *regardless of steam pressure;* also freeze-proof, trap is wide open when cold.
4. Easy maintenance: bellows is only working part . . . can be removed, inspected and replaced in a few minutes.

HELPFUL BULLETIN: Send for Bulletin 145, "Selecting The Right TYPE Steam Trap." Gives characteristics of each type of trap and shows which type to use on various installations.

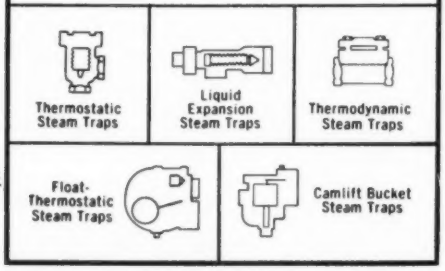
ENGINEERING SERVICE: Because only Sarco makes all five types of traps, Sarco can give you impartial advice on your trapping problems. Check your local Sarco sales representative next time a problem arises, or write Sarco Company, Inc., Empire State Building, New York 1, N. Y.

SARCO BALANCED PRESSURE THERMOSTATIC STEAM TRAP

Sizes ¾" to 2", pressures to 300 psi.
Write today for Bulletin 250.

Only Sarco Makes All 5 Types

. . . that's why Sarco can give impartial advice on trap selection



SARCO *improves product quality and output*

STEAM TRAPS • TEMPERATURE CONTROLLERS • STRAINERS • HEATING SPECIALTIES

For more facts circle 528 on Reply Card

BULLETINS just released and of immediate plant interest

MATERIALS HANDLING

101 **Handling Equipment**—Several of this manufacturer's new products are described in this comprehensive 48-pp catalog, including steel boxes with lap joints, a stand and reel for handling steel coils and a new type nesting stacking box. Book presents a wide range of other materials handling equipment—stacking boxes, skid boxes, skids, racks, trucks and trailers. Fully illustrated, gives sizes and application suggestions. Palmer-Shile Co.

102 **Cranes for Big Jobs**—A new 1½-yard shovel, 35-ton crane is described in this 6-pp catalog. Action pictures of the machine in quarries and gravel plants are included, along with general specifications. American Hoist & Derrick Co.

103 **Industrial Cranes**—Bulletin CR-610, is a 30-pp, generously illustrated catalog on cranes and how to select them. Filled with photos of cranes in use, booklet discusses selection factors, operating speeds, crane clearances; gives specifications. Includes detailed information on girders, bridge drives, trolleys, controls. Ederer Engineering Co.

104 **Cutting Handling Costs**—How properly planned materials handling can cut production costs is explained in a non-technical guide of approximately 90 pp, intended to help plant engineers analyze their own problems. Gives concise explanations of the "whys" and "hows" of effectively applying mechanized materials handling procedures to manufacturing, processing and warehousing operations. Sections on advantageous use of manpower, methods simplification and use of flow chart symbols are included. The "Cost Cutter" also presents 24 case histories of handling methods. Includes discussion of special attachments for fork trucks. Automatic Transportation Co.

The Reader Service Card nearby needs no postage. Just circle item numbers of all bulletins wanted. Be sure to include your name, your job title and company name.

105 **Trailer Couplers**—Bulletin M-130 describes and illustrates manufacturer's Safety Self-Coupler, adaptable to any caster-type trailer. Stresses safety of operation by reduction of manual functions, increased efficiency of tractor-trailer operation, other advantages. The Mercury Mfg. Co.

CONSTRUCTION

106 **Industrial Flooring**—This 16-pp catalog discusses use of Ancor rolled steel flooring plates in armoring heavy-duty industrial concrete floors. Describes design characteristics which prevent buckling and cracking and eliminate slipperiness and noise. In-use photos show installations of these plates interlocked in a concrete imbedment layer. Other photos show proper installation procedure. Flash-Stone Co., Inc.

107 **Architectural Use of Aluminum**—The first four of a series of drawings detailing use of aluminum as an exterior wall facing material are now available. These drawings illustrate some outstanding achievements in recent construction with aluminum in institutions and commercial buildings. The specifications can be adapted for other buildings, and the erection drawings show how the various types of aluminum panels are installed. Aluminum Co. of America.

108 **Industrial Doors**—This 16-pp 1954 door catalog furnishes listings and illustrations of manufacturer's line of doors, and provides helpful information on their use. Describes designs for turn-over, bi-fold and telescoping canopy doors, vertical lift, slide, and special purpose doors. International Steel Co.

METALS

109 **Continuous-Cast Bronzes**—This 12-pp bulletin describes, illustrates Asarco continuous-cast bronze products including copper alloy rods, valve guides, air brakes, packaging machinery. Tables include typical physical properties of foundry alloys cast by three methods; impact tests revealing high safety factor for heavy-duty parts. Lists specifications, sizes, weights on rods, bars. American Smelting and Refining Co.

110 **Metal in Chemical Processing**—Form SS-11, 34-pp, covers use of stainless steel in manufacture of acids and other chemicals, in the general process industries, plastics, pharmaceutical manufacture, soap and dye making. Includes corrosion resistance data, fabricating information, and a stainless steel finder. Allegheny Ludlum Steel Corp.

111 **Cast Bronze, Copper**—Sections of this 24-pp booklet on cast bronze and copper products deal with company's research, process, engineering and production facilities. Also provided is an alloy chart listing composition, analyses, properties and applicable specifications of copper, babbitt, bronze and aluminum alloys. Performance characteristics and specific product uses are listed. National Bearing Div., The American Brake Shoe Co.

112 **Why Porous Chromium**—This 16-pp illustrated booklet, presented in question-and-answer form, tells what company's Porus-Krome is and explains how it holds lubricating oil when applied to cylinder bores and other bearing surfaces, thus extending cylinder and ring life. Tells purpose of pores, why Porus-Krome outwears metals commonly used for cylinder surfaces. The electrolytic process of applying Porus-Krome is discussed, and some typical examples of its applications are presented. Van der Horst Corp.

113 **Engineering Properties of "S" Monel**—This 7-pp technical booklet gives the engineering properties of "S" Monel, an age-hardenable casting alloy providing strength, hardness and anti-galling properties at temperatures up to 1100 F, in addition to the general corrosive resistance of Monel. Nine tables give listing composition, physical constants, mechanical and compressive properties, speeds for machining casting materials. The International Nickel Co., Inc.

114 **High Temp Tubing Steel**—An alloy tubing steel widely used in elevated temperature service where high corrosion resistance is desirable is discussed in Technical Data Card TDC 151. Includes data on mechanical and physical properties, bending, welding, and heat treatment of this metal, company's Croloy 9M (8 to 10 per cent chromium, 1 per cent molybdenum). Tubular Products Div., The Babcock & Wilcox Co.

May, 1954

Card void after 6 months.

(Please Print or Typewrite)

Your Name.....

Your Title.....

Your Company Name.....

Company Address.....City.....State.....

(If you prefer delivery at your home also fill below)

Home Address.....City.....State.....

PLANT ENGINEERING

Please have manufacturers send without obligation information on bulletins indicated by numbers circled.

DATA FILE

PRODUCTS

BULLETINS

ADVERTISED PRODUCTS

Use this space to ask for tear sheets, other information wanted.

.....

.....

ELECTRICAL EQUIPMENT

115 **Electrical Modernization** — Booklet B-6133, 16 pp, titled "Compete or Collapse," points out need for efficient distribution of electrical power in plants. Describes principal elements of modern system, citing advantages of increased output and safety, lower operating cost, less down time and maintenance. Westinghouse Electric Corp.

116 **Distribution Systems**—Bulletin 35, 28 pp, fully illustrated, catalogs company's heavy duty trolley busway electrical distribution systems, describes 225-, 375- and 500-amp systems for heavy duty cranes and hoists, machine tools, conveyor assembly lines. Sections show installation planning and procedures, methods of mounting. Sectionalizing aids in equipment selection. Feedrail Corp.

117 **Building Wire Handbook**—Form BW-1, 34 pp, is a pocket-size catalog covering company's line of building wire. A technical section provides tables and other information most frequently required in selection and use of building wire and cable, all data conforming to 1953 National Electrical Code. Triangle Conduit & Cable Co., Inc.

118 **Ballast Selection Guide**—Bulletin GEC-983B, 6 pp, contains wiring diagrams for 24 fluorescent lamp ballasting circuits, cross-section dimensions, list prices, and electrical specifications for all types of company's ballasts, including those for general fluorescents, outdoor applications, rapid start lamps, others. General Electric Co.

119 **Transductor Magnetic Amplifier**—Technical Data Bulletin TD 52-601, 8 pp, discusses current and potential transductor magnetic amplifiers for instrumentation, metering and control of d-c currents and voltages requiring isolation. Includes magnetic amplifier terms, applications for transductor Magamps in various systems, operating characteristics. Graphs show rated control current vs. output current of three transductor Magamps. Westinghouse Electric Corp.

BOILERS, GENERATORS

120 **Packaged Boilers**—This new bulletin describes packaged boilers in sizes to 500 hp, pressures to 250 psi, which are particularly suited for school installations. Discusses construction details, gives ratings and dimensional data and explains their advantages for use in steam process as well as steam and hot water heating service as applied to schools. Some installations are pictured, many others listed. Orr & Sembower, Inc.

121 **For "On the Spot" Steam**—This bulletin presents advantages of the Electro-Steam Generator designed to supply 100 lb of steam pressure in 5 min. Tells how generator works, how simply it is installed, and includes general specifications. Use of this generator in building maintenance, and other applications is illustrated. Columbia Industries, Inc.

MECHANICAL POWER TRANSMISSION

122 **Chain Drives**—Catalog 154, 20 pp, explains operating characteristics, service factors of manufacturer's pre-selected drives; how to select the proper drive; lubrication and maintenance. Tables give specifications, prices, hp capacities. The Ramsey Chain Co., Inc.

123 **Power Transmission Equipment**—Form 118, 24 pp, gives descriptive and technical information on variable speed pulleys, wide V-belts, sheaves, motor bases, countershafts, and Select-O-Speed transmissions. Illustrated with photos and dimensional drawings, booklet provides ratings, sizes, application and installation tips. Lovejoy Flexible Coupling Co.

124 **Chain Drives**—A comprehensive study of silent chain drives, 88-pp Book 2425 is well illustrated, compiled for easy reference. An opening section lists pre-engineered stock drives for normal requirements. Another section outlines procedure for selecting completely engineered drives, and includes service factors, rating tables, chain length and center distance computations. A section on drive components lists dimensions, wheel tolerances, materials; one on accessories covers casings and tensioners. Operational and technical data, including installation, maintenance and lubrication procedure are provided. Link-Belt Co.

125 **Grommet V-Belts**—Bulletin 2170, 8 pp, describes, illustrates company's grommet belts in standard and high capacity construction. Gives procedure for figuring V-belt drives; includes tables on hp ratings, belt selection, sizes, service. The B. F. Goodrich Co.

126 **Improved Truck Drive**—Design, operation and maintenance of the clutchless Hydra-tork drive for fork lift trucks is discussed in Bulletin SP-4008, 8 pp. Describes operation of torque converter, constant-mesh transmission. Illustrations include cutaway working production units, assembly and disassembly of drive. Clark Equipment Co.

127 **Bearing Chart** — Designed to enable plant engineers to evaluate their bearing functions with respect to 17 service requirements, this chart lists 17 basic performance and application elements to be considered in selecting bearings. It is arranged so that various types of bearings may be listed and evaluated. The one with the highest number of favorable "checks" is indicated as the bearing to be used. Thomson Industries, Inc.

AIR CONDITIONING

128 **Package Air Conditioner**—Bulletin C-1100-B49, 12 pp, introduces completely new package air conditioner. Illustrates two models, giving dimensions and capacities. Stresses such advantages as three-dimensional air circulation, winter climate control, versatile air discharge. Worthington Corp.

129 **Pulpit Air Conditioners**—Bulletin 1307 lists mechanical features of company's air conditioner for use in control locations where heat, dirt or fumes create hazardous working conditions. Gives tables of capacities, sizes of evaporators, condenser sections. Dravo Corp.

VALVES, TRAPS, PIPING AND FITTINGS

130 **Relief Valves** — Twenty-pp Publication 5200 is replete with data on company's multiport relief valves for steam, air and gas service. Charts, diagrams, tables and examples of plant operating conditions serve to show how to select a relief valve. Text and illustrations show advantages of these valves over other relief valves, and booklet also shows how the Multiport relief valve can be used as a differential pressure spillover valve or as a check valve in closed systems. Cochrane Corp.

131 **Engineered Flow Control**—"Solve These Flow Control Problems," is a bulletin covering both standard and custom-built valves for gas and oil heating applications, refrigeration and air-conditioning systems and general industrial use. Concise descriptions of capacity, orifice and connection sizes, lifts are given. A-P Controls Corp.

132 **Automatic Regulating Valves**—Catalog 207, 24 pp, describes manufacturer's pressure regulating and relief valves, for steam, air, water and gas. Includes a descriptive index and tables giving capacity factors, basic steam and water capacities, dimensions and weights; explains capacity computation. Illustrates, describes controls for steam and hot fluids, air and water; other company products. Schade Valve Mfg. Co.

133 **Blow-Off Valves**—Twenty-pp Catalog 12-D1 features a redesigned line of blow-off

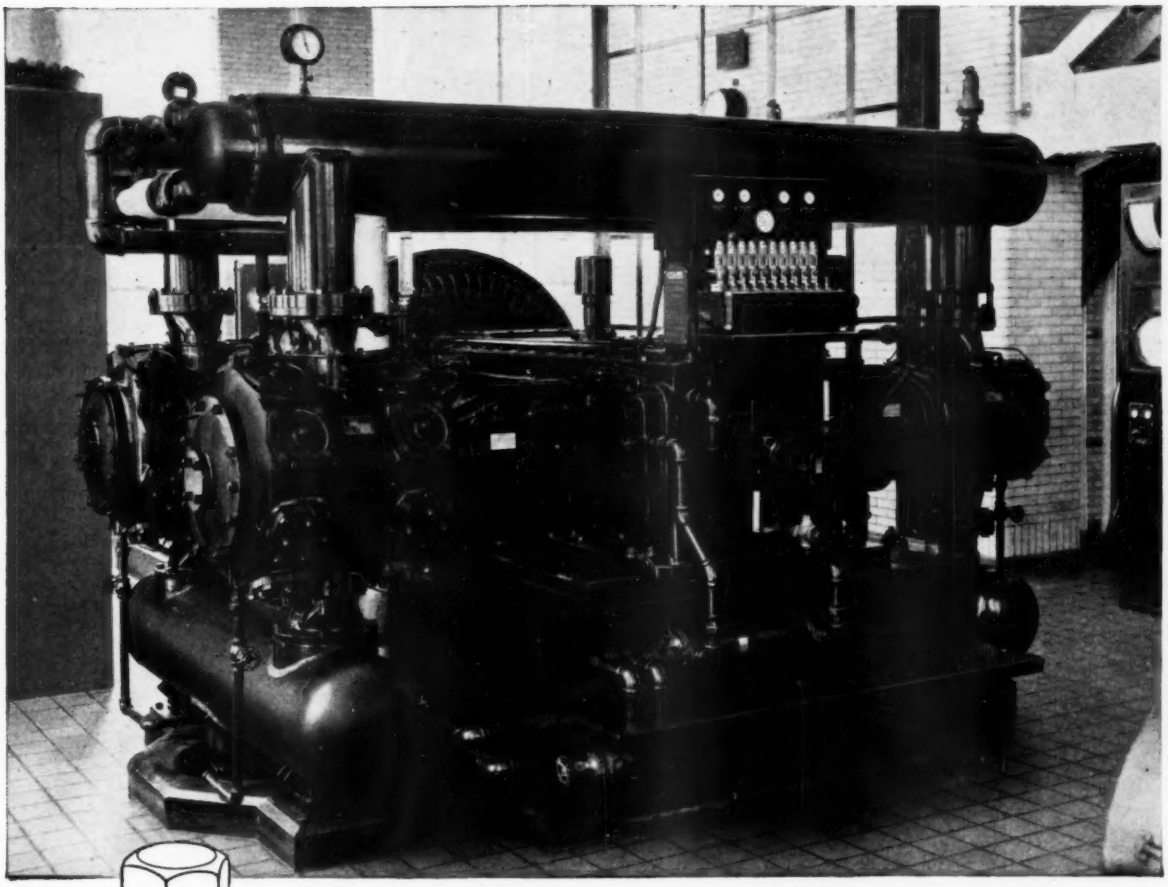
(Continued on page 219)

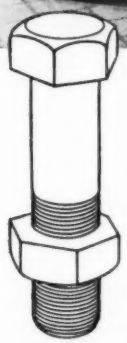
BUSINESS REPLY CARD
No Postage Stamp Necessary If Mailed in the United States

Postage will be paid by

PLANT ENGINEERING
110 South Dearborn
CHICAGO 3, ILLINOIS

FIRST CLASS
PERMIT No. 353
Sec. 34.9 P. L. & R.
CHICAGO, ILL.





JUST BOLT IT TO THE FLOOR

that's all Ford had to do

Expanding operations at Ford Motor Company's assembly plant in Buffalo, N. Y. demanded additional shop air capacity. It had to be installed quickly and, if possible, without disruption to existing facilities.

Inasmuch as the installation was to be on the second floor of the power house, Ford engineers selected a Clark CMA-4, 350 horsepower, Balanced/Opposed Compressor. The low installation cost was an important factor.

With the Clark motor-driven unit, it was unnecessary to run foundations all the way down to the basement. Piping, which was beneath the proposed compressor location, did not have to be moved.

Because of the perfect balance of the Clark unit, it was possible to mount the motor and compressor on a steel sub-base which was bolted to floor I-beams. No foundations were required. No pipes were relocated.

. . . nor was there any lost production. The Clark unit was tied in over a weekend.

The Buffalo assembly plant is but one of many Clark Compressor installations serving the Ford Motor Company's vast operations.

Before you consider any proposed compressor location *impossible*, it may save you money to talk it over with your nearest Clark representative. In the meanwhile, make sure you have Bulletin 118 in your files. Write today.

CLARK BROS. CO. • OLEAN, N. Y.

Division of Dresser Operations, Inc.

Sales Offices in Principal Cities Throughout the World

PRECISION BY THE TON **CLARK** **balanced/opposed compressors**

150-4500 HP

For more facts circle 529 on Reply Card

WORKS WELL Under Pressure

This True Ball Joint Makes the Difference

Dart malleable iron unions, sizes ⅛″ to 2″ are recommended for 300 lbs. working steam pressure; sizes 2½″ to 4″ for 250 lbs. working steam pressure at temperatures not over 500° F. Darts give a snug, drop-tight fit easily without excessive wrenching — and you can use them over and over again.

QUICK FACTS

- *Leakproof* because precision-machined to a true ball joint and spherically ground.
- Bronze alloy seats are extra wide, resist pitting and corrosion.
- Shoulders are heavy — can take rough treatment.
- Nut and Body are practically indestructible . . . of air-refined, high test malleable iron.

* Take the pressure off *yourself* — tell your supplier you want *Darts!*

DART
UNIONS

DART UNION COMPANY • PROVIDENCE 5, RHODE ISLAND

The Fairbanks Co. — Distributors: Boston • New York • Pittsburgh • Rome, Ga.

For more facts circle 530 on Reply Card

PLANT ENGINEERS' DIGEST

(Digest begins on page 30)

It can operate on either AC or DC, but in isolated areas, where power lines are not practical, circuits that operate on storage batteries may be employed. The carrier frequency is coupled to the power line by a capacitor, which also permits use of the carrier frequency output over auxiliary power or telephone lines if and when it is necessary.

Because the system is frequency-modulated, it provides crisp, intelligible voice communication without transmission noise or interference from motors, relays, switches or other electrical disturbances.

Practical range of the system, under normal power line conditions, is one mile. It also can provide clear two-way voice communication on as many as 10 channels without "cross-talk" interference.

Each speaker in this radio system at Fairless Works has its own volume control, for adjustment according to surrounding conditions. *From a release of Mine Safety Appliances Co., Pittsburgh, Pa.*

Ore Travels on Roller Bearings

IN ORDER TO MOVE HIGH GRADE iron ore from the Labrador wilderness to the steel mills in this country where it will be processed into steel, a 357-mile-long, single track railroad is being built between the mines at Knob Lake and Seven Islands on the St. Lawrence River.

Due to rigorous climatic conditions, the mine and railroad will operate during only 5½ months of the year, but even so, each ore car is expected to travel 33,500 miles per season.

Average speed of the ore trains will be 35 mph with a maximum speed of 55 mph. A round trip will be completed every 3½ days.

With the Iron Ore Co. of Canada expecting to ship two million tons of ore this year and 10 million tons each season thereafter, 60 to 70 tons of ore will be handled daily.

It is estimated that about 2,000 ore cars will be required for this operation; also some 400 miscellaneous cars and 5 general purpose diesel locomotives to haul the trains. Considering the fact that rolling stock is expected to operate under rigorous conditions, the railroad was faced with the problem of whether to equip the railway car journals with roller bearings or with plain bearings.

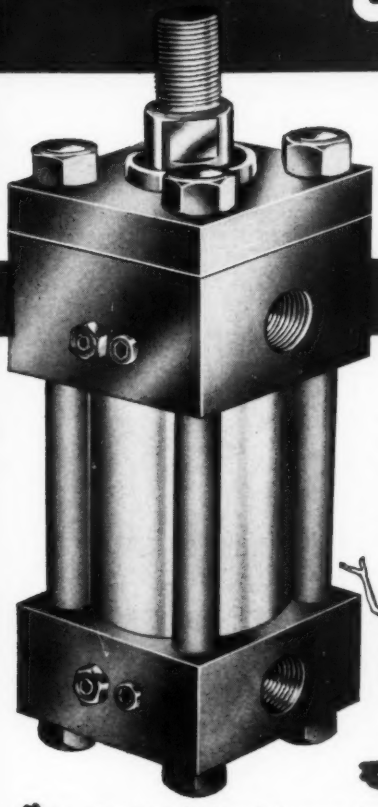
A study of all the factors involved,

Augmenting Miller's Quality-Famous Line of "Custom-Built" Cylinders...

Miller Stock AIR AND HYDRAULIC CYLINDERS

Available for *Immediate Delivery...*

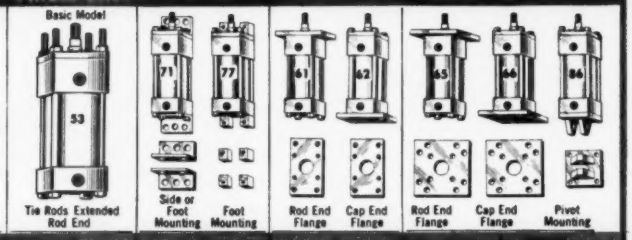
in the popular sizes, mountings and prices listed below



Any of the interchangeable "stock" mountings illustrated can be easily attached to Basic Model 53 with the tie rod nuts in a few moments. This gives you a wide selection of models for **immediate use**—and permits easy conversion to other models for **future re-use**. You save delivery and production time, investment cost and storage space.

ORDER DIRECTLY FROM THIS LIST

"Stock" Cylinders are shipped as Basic Model 53. Your selection of Mounting Attachments are shipped (unattached) with cylinders. Prices are F.O.B. our plant.



			BASIC CYLINDER PRICES ONLY		PRICES OF MOUNTING ATTACHMENTS ONLY					
Bore	Stroke	Cushion	AIR A53	HYD. H53	AIR A77 A71	HYD. H77 H71	AIR A61 A62	HYD. H61 H62	AIR A65	HYD. H65 H64 H66
1½"	2"	Non		$58.50		$2.90		$8.20		$14.35
1½"	4"	Non		60.70		2.90		8.20		14.35
1½"	6"	Non		62.90		2.90		8.20		14.35
1½"	8"	Non		65.10		2.90		8.20		14.35
1½"	11"	Non		68.40		2.90		8.20		14.35
2"	2"	Non	$37.70		$2.05		$4.60		$6.90	
2"	4"	Non	39.40		2.05		4.60		6.90	
2"	6"	Non	41.10		2.05		4.60		6.90	
2"	8"	Non	42.80		2.05		4.60		6.90	
2"	11"	Non	45.35		2.05		4.60		6.90	
2"	3"	Both	62.05	94.50	2.05	2.95	4.60	8.55	6.90	17.05
2"	5"	Both	63.75	97.00	2.05	2.95	4.60	8.55	6.90	17.05
2"	7"	Both	65.45	99.50	2.05	2.95	4.60	8.55	6.90	17.05
2"	9"	Both	67.15	102.00	2.05	2.95	4.60	8.55	6.90	17.05
2"	13"	Both	70.55	107.00	2.05	2.95	4.60	8.55	6.90	17.05
2½"	2"	Non	41.45	73.30	2.25	2.95	4.80	9.00	7.55	19.80
2½"	4"	Non	43.35	76.00	2.25	2.95	4.80	9.00	7.55	19.80
2½"	6"	Non	45.25	78.70	2.25	2.95	4.80	9.00	7.55	19.80
2½"	8"	Non	47.15	81.40	2.25	2.95	4.80	9.00	7.55	19.80
2½"	11"	Non	50.00	85.45	2.25	2.95	4.80	9.00	7.55	19.80
3¼"	3"	Both	77.80	126.85	2.55	4.35	6.35	11.75	9.90	23.10
3¼"	5"	Both	79.80	129.85	2.55	4.35	6.35	11.75	9.90	23.10
3¼"	7"	Both	81.80	132.85	2.55	4.35	6.35	11.75	9.90	23.10
3¼"	9"	Both	83.80	135.85	2.55	4.35	6.35	11.75	9.90	23.10
3¼"	13"	Both	87.80	141.85	2.55	4.35	6.35	11.75	9.90	23.10
4"	2"	Non	56.25	106.00	2.85	5.15	6.70	12.90	11.05	26.80
4"	4"	Non	58.85	109.40	2.85	5.15	6.70	12.90	11.05	26.80
4"	6"	Non	61.45	112.80	2.85	5.15	6.70	12.90	11.05	26.80
4"	8"	Non	64.05	116.20	2.85	5.15	6.70	12.90	11.05	26.80
4"	11"	Non	67.95	121.30	2.85	5.15	6.70	12.90	11.05	26.80
5"	3"	Both	98.25		3.15		7.00		12.35	
5"	5"	Both	101.65		3.15		7.00		12.35	
5"	7"	Both	105.05		3.15		7.00		12.35	
5"	9"	Both	108.45		3.15		7.00		12.35	
5"	13"	Both	115.25		3.15		7.00		12.35	
6"	2"	Non	80.60		3.35		7.25		13.55	
6"	4"	Non	84.90		3.35		7.25		13.55	
6"	6"	Non	89.20		3.35		7.25		13.55	
6"	8"	Non	93.50		3.35		7.25		13.55	
6"	11"	Non	99.95		3.35		7.25		13.55	
8"	3"	Both	157.35		3.70		10.55		17.60	
8"	5"	Both	162.45		3.70		10.55		17.60	
8"	7"	Both	167.55		3.70		10.55		17.60	
8"	9"	Both	172.65		3.70		10.55		17.60	
8"	13"	Both	182.85		3.70		10.55		17.60	

Miller "Stock" Cylinders fully meet the J.I.C. Standards and are identical to Miller "Custom-Built" Cylinders in design and construction.

"Stock" Air Cylinders are for 200 psi operation, "stock" hydraulic cylinders for 2000-3000 psi operation. Piston Rods of "Stock" Cylinders are "Style No. 2 Standard."

For complete descriptive and dimensional data on both "Stock" and "Custom-Built" Miller Cylinders, write for Bulletins A-105 and H-104 sent FREE on request.

Sales and Service From Coast to Coast!

Consult your local directory or write us direct for the name of our representative for your area

Complete Miller "custom-built" line includes: air cylinders, 1⅛" to 20" bores, 200 psi operation; low pressure hydraulic cylinders, 1⅛" to 6" bores for 500 psi operation, 8" to 14" bores for 250 psi operation; high pressure hydraulic cylinders, 1⅛" to 12" bores, 2000-3000 psi operation. All mounting styles available. Also, a complete line of Fluid Pressure Boosters and Accumulators.

For more facts circle 531 on Reply Card

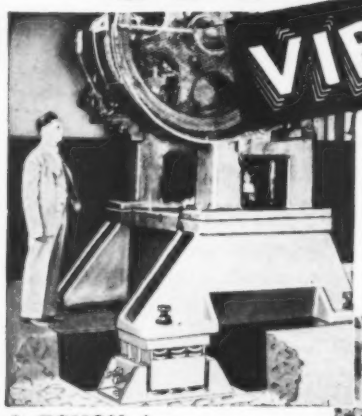
MILLER FLUID POWER CO.

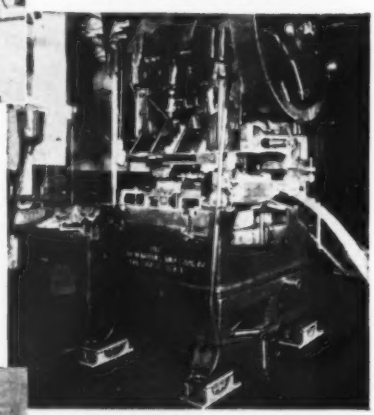
(Formerly MILLER MOTOR COMPANY*)*

2011 N. Hawthorne Ave. Melrose Park, Illinois

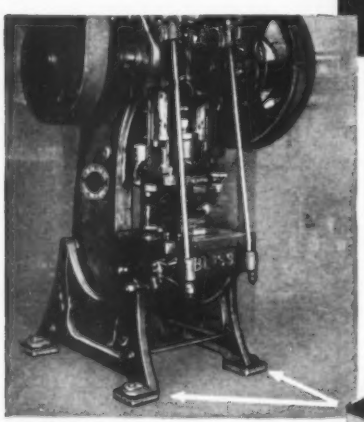
AIR & HYDRAULIC CYLINDERS • BOOSTERS • ACCUMULATORS
COUNTERBALANCE CYLINDERS

STOP VIBRATION with KORFUND VIBRATION CONTROL

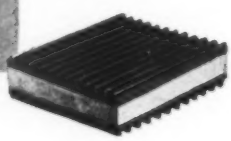




A TOUGH PROBLEM solved by specially designed Korfund Steel Spring Vibro-Isolators. Shock from this 100,000#-600 ton capacity press was cracking building walls. Four specially designed 25,000# capacity Korfund Steel Spring Vibro-Isolators, themselves weighing 600# each, were installed under the press. Building damage stopped and heavy production schedules were maintained. Yet, the price of the special Korfund Isolaters was less than 3% of the press cost.



AN AVERAGE PROBLEM—typical of those solved every day by Standard Korfund Steel Spring Vibro-Isolators. Vibration and noise from this double crank press, which could be felt and heard throughout the building, were stopped by Standard Korfund Steel Spring Vibro-Isolators. More and more manufacturers are discovering how Korfund Vibro-Isolators permit press installation without reinforcement of floors, permit press installation *anywhere* (even near precision equipment) for better plant layout, increase press speed and production, improve quality.



A SIMPLE PROBLEM solved inexpensively and *effectively* by Korfund Elasto-Rib Pads. In this case, Elasto-Rib Pads installed under each of the legs of this press stopped transmission of vibration and noise. For the less critical installation, Korfund Elasto-Rib Pads provide low-cost, *effective* vibration and noise control, and eliminate bolting to the floor.

PUNCH PRESSES are notorious for the amount of vibration and noise they transmit—yet in the three cases illustrated, Korfund Vibration Control units successfully solved the problem. In our files are scores of case histories describing equally satisfactory installations on many other types of machinery.

A selector chart is available giving recommendations for various vibration control problems. Write for your copy of Bulletin No. 13, or see our catalog in Sweet's Files.

For specific recommendations, contact us or the Korfund representative you'll find in most principal cities. A half-century of experience is at your disposal.

THE KORFUND CO., INC.

KORFUND VIBRATION CONTROL — SPRINGS — RUBBER — CORK

48-35R Thirty Second Place, Long Island City 1, N. Y.
In Canada: 510 Canal Bank, Ville St. Pierre, Montreal

For more facts circle 532 on Reply Card

PLANT ENGINEERS' DIGEST

(Digest begins on page 30)

together with comparative cost data, was made. This analysis resulted in the adoption of tapered roller bearings made of modified "Krupp analysis" steel containing about 4 per cent nickel and 1½ per cent chromium.

The use of roller bearings to increase ease of starting and to eliminate hot boxes has become standard practice in passenger cars. Progress of the development in the freight car equipment has been slower since these cars spend 50 per cent or more of their total service life on the tracks of railroads other than that which owns them.

In spite of this factor, however, each year finds an increasing number of new freight cars of various types being equipped with roller bearings. *From Nickel Topics, published by The International Nickel Company, New York, New York.*

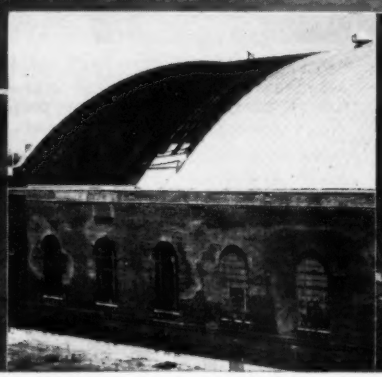
Speed Combined with Precision In Die Set Manufacture

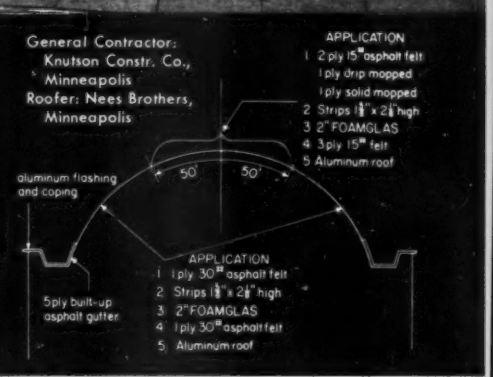
Speed and accuracy go together in production line manufacture of die sets at the Danly Machine Specialties, Inc., plant in the Chicago, Ill., area. Production line method is considered greatest advance in die set making in 30 yr. (From release of Danly Machine Specialties Incorporated, Cicero, Illinois)

Submarine Lifeline for Pumps

THREE-CONDUCTOR submarine electrical cable having a diameter of more than three inches, weighing more than eight tons and measuring 1100 ft was laid across the bottom of the Allegheny River for the H. J. Heinz Company recently.

Its purpose is to carry power from the plant to electrically driven water pumps installed on the south branch of the river to force pure water from underground wells back to the plant. Heinz uses tremendous quantities of





18,000 Gopher fans made "rain" until field house roof was insulated with FOAMGLAS

Large crowds in the University of Minnesota Field House used to be crackerjack "rainmakers." How? . . . They generated so much humidity that the original insulation on the roof became water-soaked. Then there was nothing to prevent condensation from forming on a cold underside of the roof deck. "Rain" literally fell in the field house. During a basketball game, for example, play had to be stopped frequently to mop up the floor.

FOAMGLAS, the cellular glass insulation was picked to solve this problem in 1948. It hasn't rained since. The sealed glass cells of FOAMGLAS *can not* absorb moisture, assuring constantly high insulating performance despite the high humidity inside and the frequently extreme outside temperatures in the Minneapolis area. The roof curvature was no problem with easily handled blocks of FOAMGLAS, readily shaped and fitted where necessary and with sufficient strength and rigidity to permit easy, efficient application to the roof.

Whatever *your* insulating problems may be, FOAMGLAS is the ideal answer. This strong, stay-dry insulation guarantees efficient insulating service plus unique design advantages. Let us send you our new booklets describing the use of FOAMGLAS to insulate roofs, walls, floors, ceilings, piping or equipment in normal or low temperature buildings. Write today, using the handy coupon below.

PITTSBURGH CORNING CORPORATION
One Gateway Center • Pittsburgh 22, Pa.

FOAMGLAS®

the cellular, stay-dry insulation

PITTSBURGH PC CORNING

Pittsburgh Corning also makes PC Glass Blocks

Pittsburgh Corning Corporation, Dept. PE-54
One Gateway Center, Pittsburgh 22, Pa.

Please send me a free sample and the following brand new FOAMGLAS literature:

- ☐ New booklet on FOAMGLAS building insulation.
- ☐ New booklet on FOAMGLAS low temperature insulation.
- ☐ New folder on FOAMGLAS pipe insulation.
- ☐ New folder on FOAMGLAS insulation for tanks and other equipment.
- ☐ Send engineer to discuss specific problem.

Name_____

Company_____ Title_____

Address_____

City_____ Zone____ State_____

For more facts circle 533 on Reply Card

an ACCO product

ACCO Registered* WIRE ROPE SLINGS

A STANDARD OF QUALITY

●"ACCO *Registered*" is the registered trademark applied by American Chain and Cable Company to slings of the highest grade, but it is more than just a trademark.

"ACCO *Registered*" is a definite specification of quality in both material and design.

To be "ACCO *Registered*," a wire rope sling must meet the following specifications:

1. **It must be made from high strength "Green Strand" wire rope.**
2. **All parts of the finished sling must have a breaking strength equal to the catalog strength of the sling body.**
3. **All fittings and attachments must withstand a proof-test equal to at least two times the rated capacity without permanent distortion.**
4. **Actual field service tests of each design.**

As evidence of compliance with these requirements each sling is given a metal identification tag and is accompanied by a Certificate of Proof Test and Registry.

What does ACCO REGISTRY mean to you?

It means that you can equip your shop with "lifting tools" and be confident that their designs and materials are specifically selected for the highest efficiency by trained engineers who spend all their time on slings.

It means that you can be sure that your men, materials, and machines are given the highest protection against injury during lifting operations.

Where can you get ACCO REGISTERED SLINGS?

To make ACCO *Registered* Slings immediately available for your requirements, American Chain and Cable Company, Inc. has appointed one of the best industrial supply houses in your community as an ACCO *Registered* Sling distributor. Selection for such appointment is made on the basis of the distributor's desire to serve you, his grasp of your problems, and his willingness to maintain in his stock sizes and types of slings you need.

See your ACCO *Registered* Distributor or write to us for literature and his name.

*Trademark Registered

ACCO

Wire Rope Sling Department
AMERICAN CHAIN & CABLE

Wilkes-Barre, Pa., Chicago, Denver, Houston, Los Angeles, New York, Odessa, Tex., Philadelphia, Pittsburgh, San Francisco, Bridgeport, Conn.

For more facts circle 534 on Reply Card

PLANT ENGINEERS' DIGEST

(Digest begins on page 30)

Cable on this reel is now lying in the Allegheny River; it supplies current from Heinz plant to well water pumps

water in its manufacturing processes, much of it from underground wells. *From a release of National Electric Products Corporation, Pittsburgh, Pa.*

Properties of Gear Lubricants

IN SELECTING A LUBRICANT for gears operating under normal conditions, the following points should be considered:

Viscosity. This must be the most suitable compromise when all operating conditions, temperatures, gear unit design, etc. have been considered. The viscosity of the oil is the one property that will be different in different types of gear box and all gear makers state the viscosity limits to which suitable lubricants will adhere.

Resistance to Oxidation. The oil must not oxidize in service. In the case of large gear units, where several hundred gallons of oil are in circulation, apart from small make-up, the complete charge of oil must be retained as long as practicable.

In some cases it is advisable to renew the charge every six months, but if a correctly designed system incorporating filters is employed, it might be possible for the original charge of oil to remain in service for considerably longer if it is cleaned periodically.

Resistance to Corrosion is especially important in some cases of steam turbine units. Corrosion inhibitors, which prevent rusting, when the oil becomes contaminated with water (which may be due to leaky cooling pipes or may be water of condensation), are included in good quality gear oils that need them.

High Film Strength and Oiliness is essential in all cases, but probably oiliness is most important in the case

of worm gears, to reduce the very high tooth friction. Additives are used in modern oils to increase the oil's natural film strength.

Adherence is important in the case of open gearing where lubrication depends upon the lubricant (oil or grease) sticking on the teeth.

Extreme Pressure Properties are important in the case of hypoid gears to prevent incipient welding and tearing of the teeth while in contact under high pressures.

Where a gear oil may be liable to contamination by water, as in a steam turbine unit, it must have good *demulsibility,* i.e. it must quickly separate from water. It must also have anti-rusting properties. *From Scientific Lubrication, published by Scientific Publications, Broseley, England.*

Water-Resistant Insulation

DEVELOPMENT OF A WATER-RESISTANT form of 85 per cent Magnesia insulation for hot piping and equipment offers a solution to the problem of preventing insulation damage resulting from severe water exposure. It should be useful for underground pipe lines subject to flooding, process equipment and piping requiring hosing or washing down.

Tests indicate that immersion in boiling water for nearly 400 hr, with intermittent drying on hot pipes, caused a slight roughening of the insulation surface with no loss of insulating values.

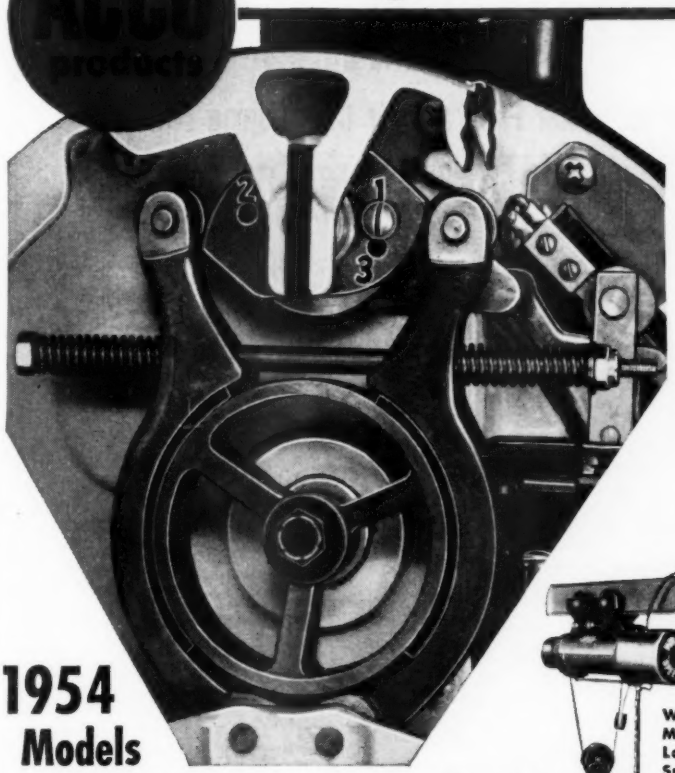
In further tests, the material was subjected to 30 cycles of immersion in boiling water, each cycle consisting of 7 hr immersion, 17 hr drying, plus 168 consecutive hours of immersion. After each immersion, pipes carrying 125 to 140 psig steam dried the insulation thoroughly.

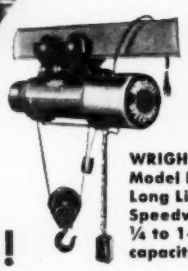
Examinations between cycles and at the conclusion of the tests for disinte-

At end of tests, water-resistant insulation (E) shows surface roughening; others in stages of disintegration

Wright Hoists

ACCO products





WRIGHT Model L-1 Long Lift Speedway ¼ to 1-ton capacities

1954 Models

SMASH MAINTENANCE COSTS!

...Nothing to adjust but the cam!

• The brake assembly pictured above for the WRIGHT FRAME 1 SPEEDWAY HOIST is your assurance of maximum hoist service... minimum down-time. Adjustment of this cam-actuated brake to compensate for brake lining wear is literally "as simple as ABC." *There is no guess work about it.*

When the load hook starts to drift, remove the screw shown at position No. 1 (*see picture*), swing the cam around so that position No. 2 is in line, and replace the screw that secures the cam to the solenoid lever arm. For the final one-third of brake lining wear, set the cam at position No. 3. This repositioning of the cam is the ONLY adjustment to be made by the users of WRIGHT Hoists. The brake springs and solenoid are factory-set... NEVER need adjustment for brake lining wear.

Long life is a built-in characteristic of these hoists. They are built and guaranteed for service to the limit of the duty cycle of 30 minute, totally enclosed NEMA specification motors. These 1954 models provide full accessibility of parts for lowest maintenance costs. To get at the brake and controller, you remove two screws which hold the end cover. To get at the limit switch, transformer, and solenoid coil, you remove three screws and the side cover comes off. With this full accessibility you can make a brake adjustment or replace electrical parts in a matter of minutes.

Remember, PRICE + MAINTENANCE = COST. For full details on the low-cost WRIGHT Frame 1 Hoists see your WRIGHT distributor or write our York, Pa., office for literature.

ACCO

Wright Hoist Division

AMERICAN CHAIN & CABLE

York, Pa., Chicago, Denver, Detroit, Los Angeles, New York, Philadelphia, Pittsburgh, San Francisco, Bridgeport, Conn.

Hoists Trolleys Cranes

For more facts circle 535 on Reply Card

NEAT AS A PIN

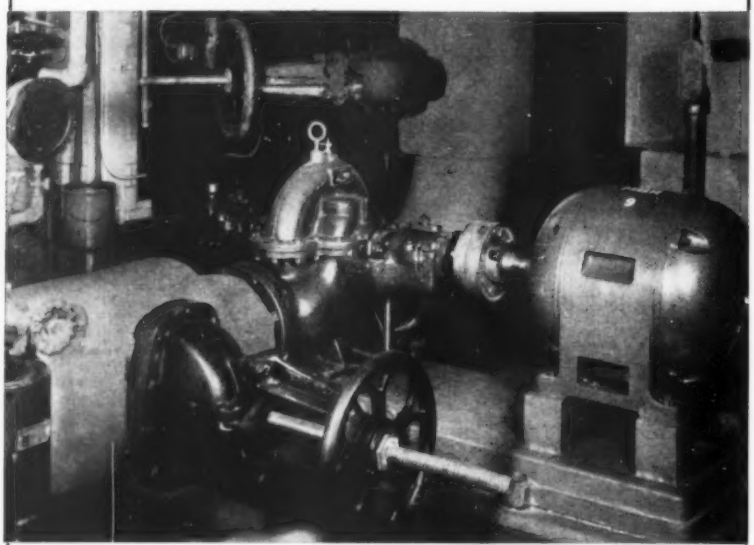
very aptly applies

to the **Power Plant and Air Conditioning** services at

Springfield Fire and Marine Insurance Co.

SPRINGFIELD, MASSACHUSETTS

Not only "neat," but highly efficient, in keeping with this large and progressive organization.



Warren Centrifugal Pump, 1380 g.p.m. on condenser water return from cooling towers

EXPERIENCE is a basic, all-important factor in the insurance business . . . important too, in the manufacture of pumping machinery . . . and so

WARREN PUMPS

with well over half a century of experience in this field exclusively, were chosen for various services, including:

Condenser Water **Secondary Water to Weathermaster**

Snow Melting **Primary Chilled Water**

For Power Plant, Air Conditioning and all pumping services, specify:

WARREN QUIMBY PUMPS

P-31

WARREN PUMPS

WARREN STEAM PUMP COMPANY, INC.

Warren, Massachusetts

For more facts circle 536 on Reply Card

PLANT ENGINEERS' DIGEST

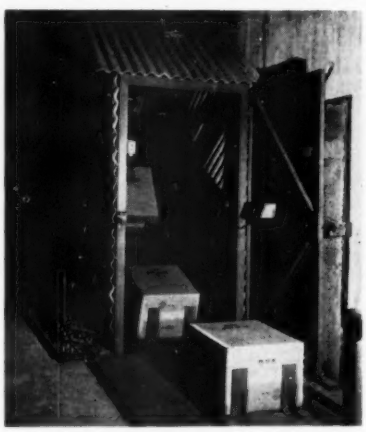
(Digest begins on page 30)

gration showed that the insulation was intact, with surfaces rougher and joints firm and in good condition. There was no appreciable shrinkage and no swelling or cutting of bands.

Since no standards existed for the measurement of insulation resistance to water damage, four other leading insulating materials were tested at the same time in the same equipment as the water-resistant insulation. All four showed severe damage within periods ranging from one hour to several cycles. *From a release of The Magnesia Insulation Manufacturers Association.*

Multi-Story Material Handling

HIGH SPEED outside steel pallet conveyor at the CBS-Columbia television receiver manufacturing plant at Long Island City cuts truck unloading and material handling time contributing to over-all plant efficiency.



Example of internal space saving and good handling practice is this use of outside conveyor to carry material from the unloading area to upper floor

The conveyor runs from the unloading platform up to the third floor of a four story plant carrying TV cabinets and cathode-ray tubes automatically into the manufacturing staging areas. *From a release of CBS-Columbia Div. Columbia Broadcasting System, Long Island City, N. Y.*

International Efforts Produce Compact Battery

BECAUSE LABORATORY performance of various types of dry and wet cell batteries developed in the past had not always resulted in a practical solution to problems, Sonotone Corpora-

NEW—*special-industry* enclosure!

Patterned after Joint Industrial Control requirements

New I-T-E particle-proof enclosure assures dependable circuit breaker operation in all dust-laden atmospheres:

EXTERNAL MOUNTING FEET
Readily accessible, for easy surface mounting.

DUST-TIGHT ENCLOSURE
Solid sheet-steel sides and back with closed welded seams. No holes—no knockouts. Attractive bonderized finish.

EXTERNAL OPERATING HANDLE
New molded handle operates circuit breaker from outside enclosure. Plate indicates position of breaker handle at all times. Handle may be padlocked in either "ON" or "OFF" position. Defeater arrangement allows authorized personnel to open cover with breaker "ON."

DOUBLE-LOCKING COVER ARRANGEMENT

GASKETED COVER
Assures tight seal when cover is shut.

DEPENDABLE I-T-E MOLDED CASE CIRCUIT BREAKER
Thermal-magnetic. Provides positive protection against short circuits and overcurrents. Quick-make, quick-break, trip-free. Assures quick restoration of service without replacement of elements. I-T-E quality design and construction.

AVAILABLE NOW
with I-T-E "E" frame, "F" frame, "J" frame, and "L" frame circuit breakers—in ratings from:
15-600 amperes
125-600 volts a-c
125-250 volts d-c

SEE YOUR LOCAL I-T-E REPRESENTATIVE OR DISTRIBUTOR
or write to *I-T-E Circuit Breaker Co.; 19th and Hamilton Sts., Phila. 30, Pa.*

I-T-E

MOLDED CASE CIRCUIT BREAKERS

For more facts circle 537 on Reply Card

NOW YOU CAN MAKE YOUR OWN NYLON REPAIR PARTS

fabricated from **POLYPENCO®/nylon shapes**

- Make one part or hundreds economically on standard metalworking tools
- Reduce wear on gears, bearings, gaskets, cam followers, etc.
- Eliminate lubrication
- Eliminate corrosion on exposed surfaces
- Eliminate backlash and noise
- Get top performance in every part with quality-controlled Polypenco nylon shapes

Immediate delivery of POLYPENCO nylon rod, tubing, strip and slab. We'll help you fabricate.

WRITE FOR GENERAL BULLETIN

POLYPENCO NYLON

nylon and teflon*/other non-metallics/*stock shapes, finished parts*

also available to your specifications

The POLYMER CORPORATION of Penna. • Reading, Penna.

In Canada: Polypenco, Inc., 2052 St. Catherine, W. Montreal, P. O.

*Trademark for Du Pont tetrafluoroethylene resin

For more facts circle 538 on Reply Card

PLANT ENGINEERS' DIGEST

(Digest begins on page 30)

tion had been seeking a small, reliable battery for its hearing aids.

After World War II the firm obtained data on German experiments in this field which, together with its own know-how has produced a 1.30-v nickel-cadmium cell. The cell uses porous nickel plates made by sintering a special nickel powder which is made in England.

Grids for both positive and negative plates are made by sintering carbonyl

Nickel-cadmium cells are serviceable, efficient over wide range of temperature

nickel powder on nickel wire screens. The positive plate is impregnated with nickel salts and the negative plate with cadmium salts. Electrolyte used is potassium hydroxide, which has a freezing point of approximately —75 F.

Recharging is reported to be rapid, 80 per cent of its charge being regained within 15 min, and complete charge in 30 min. The only servicing required is the addition of water once a year.

Tests show that the battery can deliver 70 per cent of its ampere-hr capacity at —40 F, and will operate satisfactorily at —65 F. Operational characteristics are said to be excellent up to 165 F.

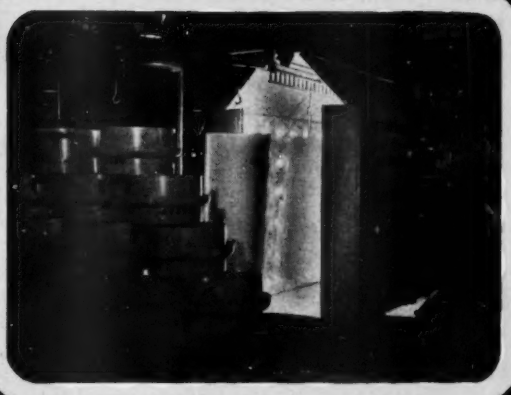
Steady currents of 100 amperes may be taken from cells having a capacity as small as three ampere-hours. By increasing the thickness of the plates the battery can be made more suitable for producing lower currents over a longer period of time.

It has been found that if left idle over a considerable period of time in either charged or discharged conditions, there is no change in capacity. *From Inco Magazine, published by The International Nickel Co., New York.*

For more facts circle 539 on Reply Card→

telling the story of 'dag' dispersions

Here is a Heat-Proof Dry-Film Lubricant



It's 'dag' colloidal graphite. It comes dispersed in a variety of liquid carriers . . . water, oils, volatile hydrocarbons, resin-solvent combinations . . . which get it where it should go, and then put it to work.

Spray it on, paint it on, apply it by dipping. 'dag' colloidal graphite produces a durable, *dry lubricating film* that won't gum up or break down at any of the temperatures you are likely to run into. It is unaffected by heat up to 750°F. . . . with a coefficient of friction so low that moving parts just keep on moving.

'dag' colloidal graphite works where conventional lubricants have failed . . . on oven conveyors, in bearings of kiln-car wheels, on conveying equipment for hot strip steel, and in places where degreasers destroy most lubricants . . . almost everywhere that high heat and friction must be licked to keep things going.

Let 'dag' colloidal graphite dispersions cure these headaches for you. Details are available in Bulletins No. 424-EO and No. 435-EO.

Dispersions of molybdenum disulfide are available in various carriers.

We are also equipped to do custom dispersing of solids in a wide variety of vehicles.

dag DISPERSIONS

Acheson Colloids Company, Port Huron, Mich.

...also ACHESON COLLOIDS LIMITED, LONDON, ENGLAND

try resin-bonded dry graphite films for permanent lubrication

PROTECT YOUR PRODUCTS

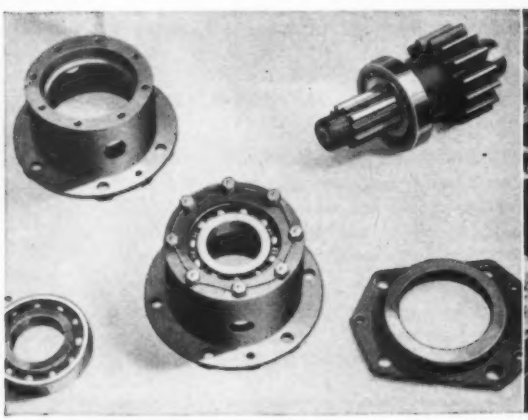
in production . . . storage . . . shipment, with

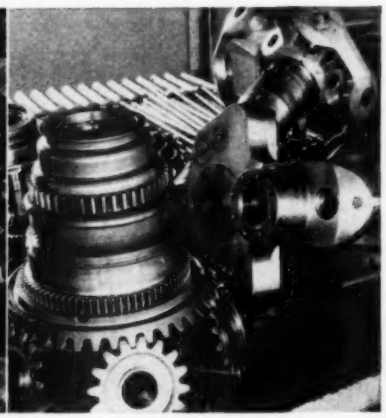
NO-OX-ID RUST PREVENTIVES

Every step of the way, industry relies on Dearborn NO-OX-ID protective coatings to control corrosion.

On production lines a NO-OX-ID shop coat seals out moisture. During long or short-term storage—indoors or outdoors—a tough NO-OX-ID film stops corrosion. NO-OX-ID also protects metal surfaces against the effects of temperature and humidity variations. When you rely on NO-OX-ID for protection, rejects are minimized and your products remain free from corrosion.

Look into industrial NO-OX-ID and the money-saving protection it will give to your metal products. A good way to do this is by talking with your Dearborn engineer. He has profitable suggestions.



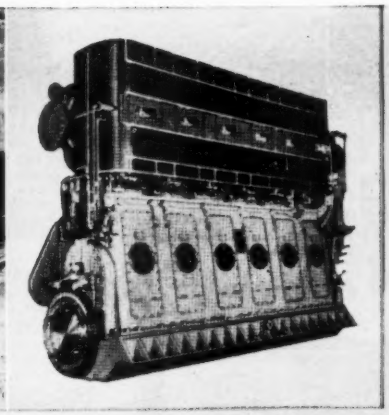


Dearborn
TRADE MARK

DEARBORN CHEMICAL COMPANY
MERCHANDISE MART PLAZA
CHICAGO 54, ILLINOIS

THE ORIGINAL
RUST PREVENTIVE

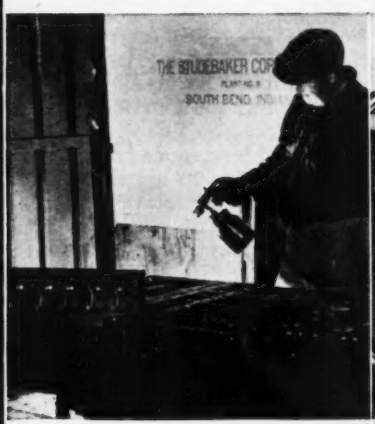
NO-OX-ID

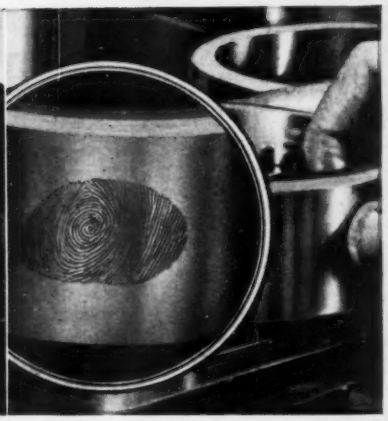


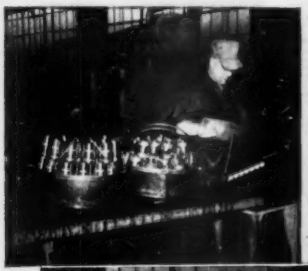
NO-OX-ID

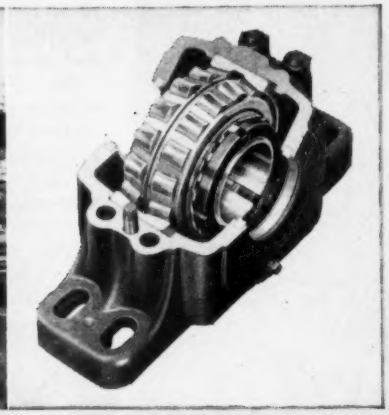
is easy to apply!

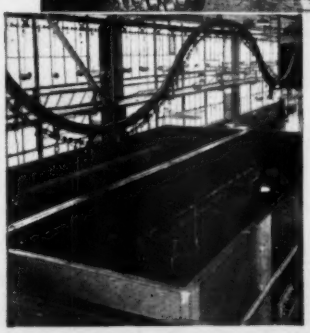
There is a NO-OX-ID application method that will fit into your plant operations and type of product. NO-OX-ID can be manually applied by brush, swab or basket immersion. On mass production lines the conveyor dip method assures fast, effective, economical protection. Cold-spray gun application is another approved method used in many plants.











know your *Dearborn* engineer

Dearborn has specialized in the control of corrosion and conditioning of water since 1887. This broad experience in rust prevention and water treatment—plus Dearborn's extensive research and laboratory facilities—are at your service—at no obligation. You'll find it will pay to consult with your Dearborn Engineer.

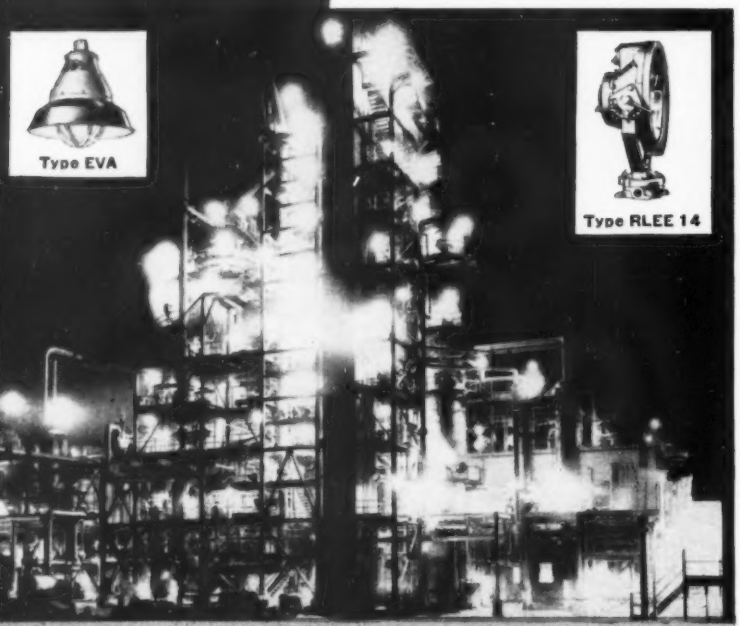
write for Bulletin No. 3076

This informative bulletin describes various industrial NO-OX-ID protective coatings, their characteristics, application methods and use recommendations. Your copy supplied promptly upon request.

For more facts circle 540 on Reply Card

You can increase production at night
CROUSE-HINDS Floodlights

. . . and they're great for protective lighting too!



A petroleum refinery lighted for round-the-clock operation with Crouse-Hinds Type EVA Explosion-Proof and Raintight Industrial Lighting Fixtures, and Type RLEE-14 Explosion-Proof Floodlights.

Production curves go up when Crouse-Hinds high efficiency floodlights are installed in yards and approaches to industrial plants.

The usefulness of many outdoor areas can be multiplied by flooding them with controlled illumination. Crouse-Hinds all-inclusive line with short, medium, and long range projectors makes it possible to get the right amount of light at the locations where it is needed. This control insures the clarity of daylight where it will do the most good, without wasteful over lighting of unused areas.

Frequently it will cost much less to project light a considerable distance with Crouse-Hinds long range floodlights than to run cable and install local lighting. There are also indoor locations in large buildings where floodlights are the most economical and satisfactory source of light.

Plenty of light is also the most reliable and cheapest form of protection against night prowlers. Sabotage and pilferage thrive in darkness. Crouse-Hinds floodlights project powerful beams of light that bathe all approaches to your property with glaring radiance, compelling everyone to be more visible than in broad daylight.

A factory yard lighted by Crouse-Hinds Type RCD-12 Lighting Fixtures. These fixtures are easy to install on buildings and are often set in the walls during construction.

This posed photograph shows the value of Crouse-Hinds searchlights for protective lighting. Their powerful beams quickly "spots" night prowlers.

FLOODLIGHTS AIRPORT LIGHTING

by using
to *turn night-time into day-time*

You will find exactly what you need in CROUSE-HINDS all-inclusive line

Explosion-Proof Floodlights. Wherever there is a possibility of the presence of explosive atmospheres, Crouse-Hinds explosion-proof floodlights will give you maximum protection. The complete line includes explosion-proof portable floodlights for temporary or emergency use.

Heavy Duty Floodlights. Crouse-Hinds line of heavy duty floodlights includes 200, 250, 500, 1000, 1500 and 2000-watt medium, and long range projectors. The slightly higher first cost is offset by lower installation and maintenance costs wherever large areas are to be lighted.

Searchlights. The mere presence of Crouse-Hinds searchlights discourages attempts at illegal entry. When such attempts are made the rascals flee in confusion the moment they are "picked up" by the powerful beam of light. Four different sizes meet every need. All can be furnished with pilot house control that permits the searchlight to be on a roof, operated from the room below.

General Purpose Floodlights. Crouse-Hinds complete line of general purpose floodlights provides efficient lighting at minimum first cost. They are widely used for lighting yards and parking lots and are ideal for industrial recreation areas and athletic fields.

Special Applications. The Crouse-Hinds line includes a number of fixtures designed for mounting in walls or ceilings for the efficient lighting of tunnels, underpasses, bridges, drives, walks, and loading areas. An ornamental lantern floodlight does a real lighting job in areas where appearance is an important factor.

A Crouse-Hinds floodlighting installation pays off in: (1) increased production; (2) prevention of accidents; (3) protection against dangerous prowlers. Pioneers in floodlighting, Crouse-Hinds illumination engineers have accumulated a wealth of lighting knowledge that is at your service. Write for additional information and ask for your FREE copy of Crouse-Hinds Bulletin 2652 "Lighting Equipment". It contains listings of hundreds of types and sizes of floodlights and explosion-proof, dust-tight, and vaportight industrial lighting fixtures.

Crouse-Hinds Type ADE-16 Heavy Duty Floodlights are used to "turn night-time into day-time" at this plant for 24-hour production.

A parking lot efficiently lighted by Crouse-Hinds Type FLA General Purpose Floodlights.

CROUSE-HINDS COMPANY
Syracuse 1, N. Y.

OFFICES Birmingham — Boston — Buffalo — Chicago — Cincinnati — Cleveland — Dallas — Denver — Detroit — Houston — Indianapolis — Kansas City — Los Angeles Milwaukee — New Orleans — New York — Philadelphia — Pittsburgh — Portland, Ore. — San Francisco — Seattle — St. Louis — St. Paul — Tulsa — Washington.
RESIDENT REPRESENTATIVES Albany — Atlanta — Baltimore — Charlotte — Corpus Christi — Reading, Pa. — Richmond, Va. — Shreveport
Crouse-Hinds Company of Canada, Ltd., Toronto, Ont.

A Nationwide Distribution Through Electrical Distributors

TRAFFIC SIGNALS CONDULETS

For more facts circle 541 on Reply Card

IN ONE MINUTE'S TIME

AWS Class E-6012 electrode produced this fillet

THIS MUCH MORE WELD

was made in the same time in the same steel plate

with the new

AIRCO®

EASYARC 12

Airco's new EASYARC 12 actually welds mild steel in about half the time it takes with conventional AWS Class E-6012 and E-6013 electrodes. EASYARC 12 has a completely new type of flux coat that contains a high proportion of powdered metal. This lets you use higher currents without breakdown of the coating, and vastly increases deposition rates, since the flux itself adds metal to the weld.

Besides being fast, EASYARC 12 is far easier to handle. Welds are made by "dragging" the electrode along the joint. Spatter is almost negligible. And EASYARC 12's slag is practically self-cleaning.

For complete information and prices — get in touch with your Airco office or dealer right now.

Actual length of welds: E-6012 — 5-1/16", Easyarc 12 — 12". Current settings: 230 amps AC for E-6012; 275 amps AC for Easyarc 12. Both welds made in 1/4" plate with 3/16" dia. electrodes.

AIR REDUCTION

60 East 42nd Street • New York 17, N. Y.

Divisions of Air Reduction Company, Incorporated with offices and dealers in most principal cities

Air Reduction Sales Company
Air Reduction Magnolia Company
Air Reduction Pacific Company
Internationally by Airco Company International

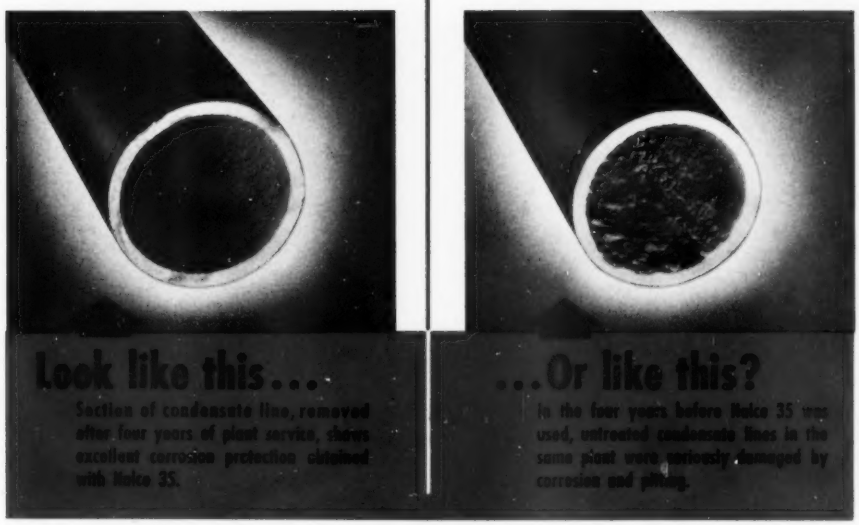
at the frontiers of progress you'll find

AN AIR REDUCTION PRODUCT

For more facts circle 542 on Reply Card

In the next 4 years...

Will your condensate return lines



Look like this...

Section of condensate line, removed after four years of plant service, shows excellent corrosion protection obtained with Nalco 35.

...Or like this?

In the four years before Nalco 35 was used, untreated condensate lines in the same plant were seriously damaged by corrosion and pitting.

See next page for data on how to keep your condensate return lines clean and corrosion-free . . . permanently.

THE Nalco SYSTEM...
SERVING INDUSTRY THROUGH PRACTICAL APPLIED SCIENCE

NATIONAL ALUMINATE CORPORATION
6216 W. 66th Place, Chicago 38, Ill.

Send me:

- ☐ Bulletin 35 . . . "Stop Condensate Corrosion in Return Lines, Tanks and Heaters."
- ☐ Reprint 29 . . . "Use of Amines in Low Make-Up Steam Plant."
- ☐ Reprint 30 . . . "Amines for Corrosion Prevention in Steam Condensate Systems."

NAME _____

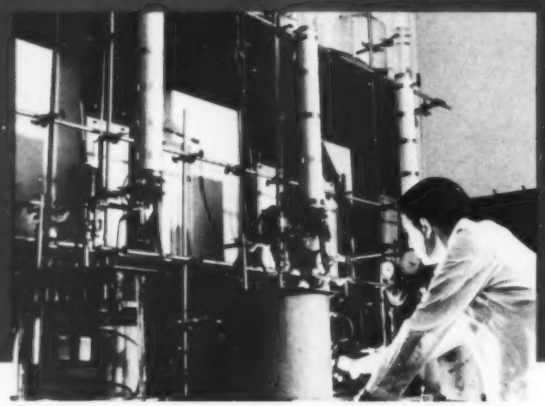
TITLE _____

COMPANY _____

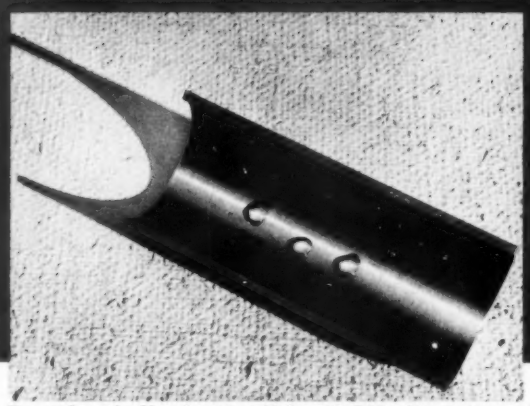
ADDRESS _____

CITY _____ ZONE _____ STATE _____

TWO *Nalco* METHODS FOR POSITIVE CONDENSATE CORROSION PREVENTION



Continuous corrosion-prevention research in Nalco Laboratories has developed outstanding control methods and chemicals for many types of corrosion problems.



Treated with film-forming Nalco 35-FM, this section of condensate pipe shows complete repellence to water droplets. Corrosive condensate never touches metal.

Nalco 35 PREVENTS CORROSION BY pH CONTROL

Nalco 35 controls pH in the condensate return system . . . neutralizes carbon dioxide to assure corrosion prevention. Especially recommended for low make-up systems, Nalco 35 vaporizes and condenses with the steam, *and at the same rate*. Uniform treatment concentration is assured throughout the system; and long-lasting Nalco 35 makes positive return-line, tank, and valve protection a real operating economy.

Nalco 35 FM PREVENTS CORROSION BY PROTECTIVE FILM

Nalco 35 FM protects metals in steam systems by forming a tough, rustproof microscopic film on all exposed surfaces. Corrosive gases and liquids cannot reach the metal surface to cause damage.

Nalco 35 FM is fed with a low-cost Nalco condenser-feeder, or any good chemical pump, directly into steam or condensate lines. Once your steam system has protection of Nalco 35 FM film, low dosages maintain film permanently.

Nalco WATER TECHS

Use the postpaid return card to get your copies of up-to-the-minute literature on condensate corrosion control listed on the reverse side of the card.

FIRST CLASS
PERMIT No. 3623
(Sec. 34.9, P.L.&R.)
CHICAGO, ILL.

BUSINESS REPLY CARD

NO POSTAGE STAMP NECESSARY IF MAILED IN THE UNITED STATES

4c. —POSTAGE WILL BE PAID BY—

National Aluminate Corporation
6216 West 66th Place
Chicago 38, Illinois

THE *Nalco* SYSTEM...
SERVING INDUSTRY THROUGH PRACTICAL APPLIED SCIENCE

IF YOU USE STAINLESS OR HIGH ALLOY TUBING

this new booklet was written for you...

Whether you're an engineer who wants technical information in a hurry, or a new user of tubing looking for the full story of stainless and high-alloys, you'll find this booklet equally valuable.

In it, discussed by classification, you'll find data on pressure, sanitary, mechanical, heat-resistant, ornamental and other forms of stainless and high-alloy welded tubing. There are engineering data on joining methods, welding techniques, bending and installation hints. Also included are complete tables of bursting pressures, physical and chemical properties of stainless steels and other alloys, and corrosion and temperature data. This is only a partial list of contents, but it will give you an idea of the wealth of pertinent, factual information the booklet contains.

To get your free copy, just drop us a note on your company letterhead. There is no obligation, of course.

TRENTWELD

STAINLESS STEEL TUBING

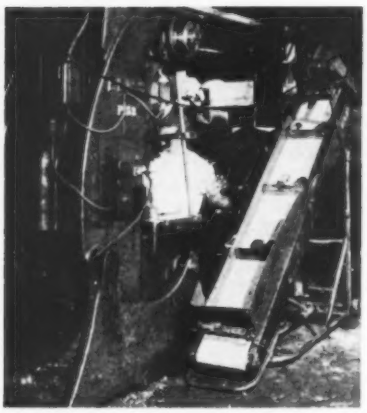
TRENT TUBE COMPANY, GENERAL SALES OFFICES, EAST TROY, WISCONSIN (Subsidiary of CRUCIBLE STEEL COMPANY OF AMERICA)

For more facts circle 544 on Reply Card

OPERATION AND PRODUCTION pointers for the industrial plant engineer

Edited by H. E. B. Anderson

Conveyor Belt Takes Abuse



Sharp-edged steel pulley blanks are thrown onto conveyor belt from press

PARTLY FORMED, sharp-edged steel pulleys ride "rough-shod" over a new Koroseal conveyor belt, manufactured by the B. F. Goodrich Co. The steel cups eventually become pulleys for automobile fan belt drives.

Several factors contribute to the tough service given the belt. The metal parts are bathed in oil, belting's natural enemy; the operator loads the conveyor by throwing the sharp-edged parts on the belt; and bolt holes for attaching metal cleats to the belt form channels in which oil accumulates.

In service of this type, belts previously lasted two or three weeks before deteriorating, while the Koroseal conveyor belt has shown excellent resistance to abrasion, oils and greases.

Concrete "Rules of Thumb"

OUTLINED BY the National Ready Mixed Concrete Association, the following rules consider some of the factors which affect the strength of concrete.

1. For a concrete of a given slump and a given maximum size of aggregate, the addition of one sack of cement per cubic yard will increase the 28-day comprehensive strength approximately 1000 psi.

2. The addition of one gallon of water per cubic yard of concrete will increase the slump one inch.

3. For concrete having given proportions of dry ingredients, each increase of one inch in slump will decrease the 28-day strength about 200 psi.

4. For properly proportioned mixtures of the same slump, doubling the maximum size of the aggregate will result in an increase in 28-day strength of about 400 psi.

5. For properly proportioned mixtures, comparable as to cement content and slump, air entrainment in usual amounts will affect strength according to the richness of the mix. In lean mixtures, no effect or a slight increase will result; in mixtures of intermediate richness, a reduction of two or three per cent for each per cent of entrained air; in rich mixtures, a reduction of four to five per cent for

(Continued on page 58)

Paper Mill Water Chest Prefabricated, Put on Rollers for Quick Installation

Contributed by Richard Martin, St. Regis Paper Co.

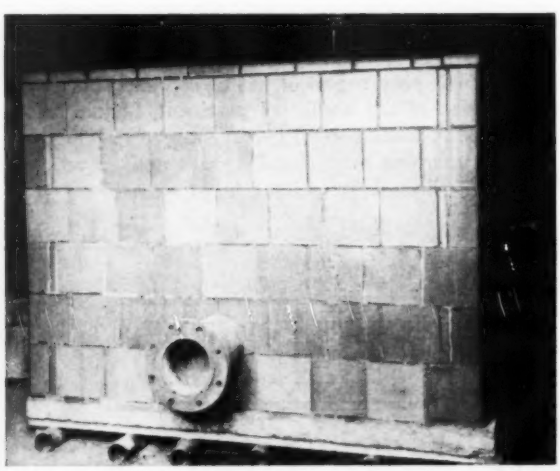
LIMITED SHUTDOWN TIME, usually 24 hours, requires considerable preplanning in paper mill maintenance work. Typical of the planning in our mill problems was the need to replace a wooden white water chest in the system of our Fourdrinier machine. The replacement chest was to be of tile construction, which required a much longer mill shutdown for fabrication and "curing" prior to operation.

Solution to the problem was the use of prefabricated tile chest. The chest was constructed in an area convenient to its final installed location, and the foundation slab was mounted on pipe rollers for portability.

Internal control equipment was installed in the chest prior to installation, and exterior pipe connections were positioned to coincide with existing lines when the chest was rolled into place.

With the chest completed, all the shutdown time required for the changeover was that necessary to remove the wooden chest, roll the tile chest into place and connect the piping.

Interior of prefabricated white water chest, partially fitted

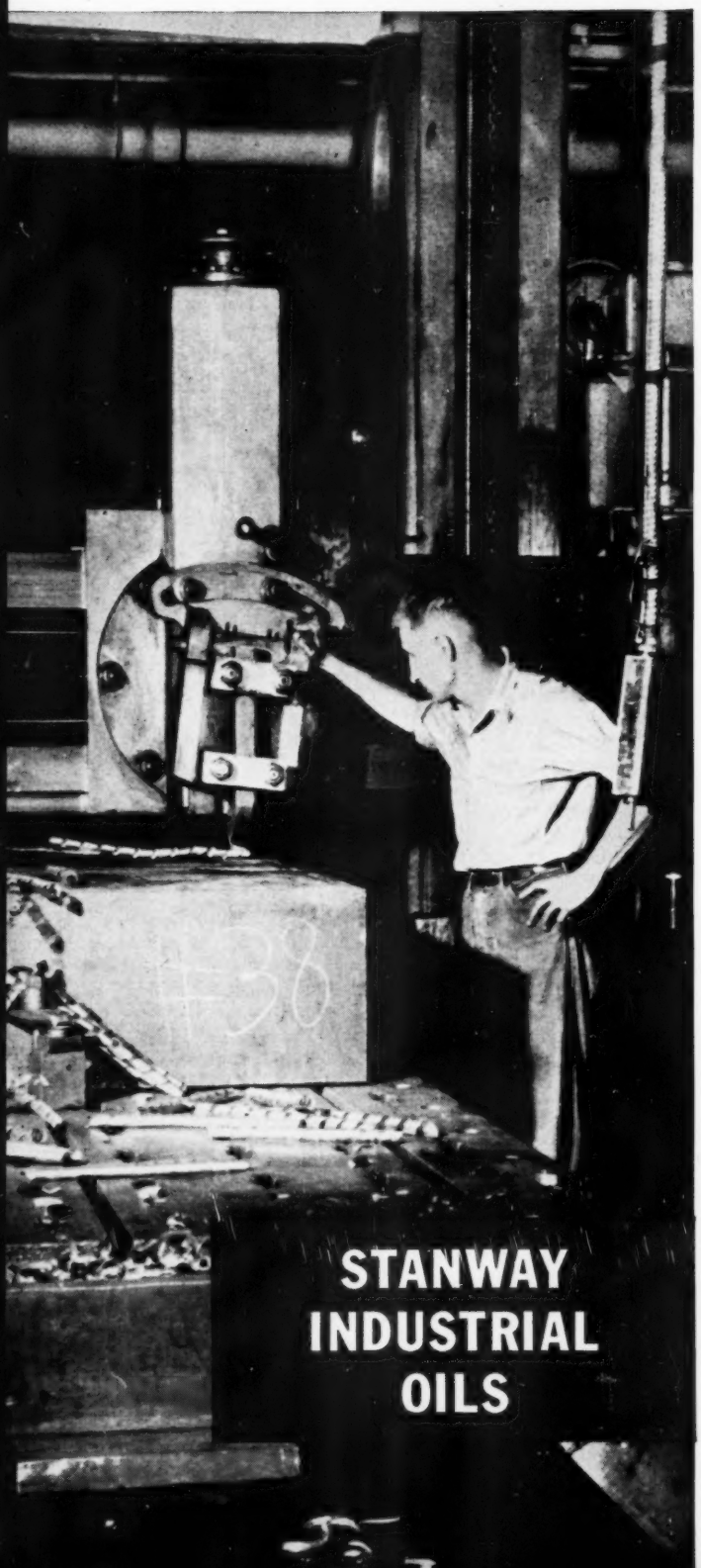


Exterior of chest. Pipe flange is ready for quick connection

For more facts circle 546 on Reply Card ⟶

How a little talk
(with the right person)

The "right person" was E. F. Aschemeyer, at left, Standard Oil lubrication specialist. His practical experience and training helped Elkin solve *their* problem.



stopped a lot of chattering

Chattering and scoring of ways was causing trouble for the Elkin Tool and Manufacturing Company of Detroit. The trouble was noted on a big planer operating under extremely heavy loads. A Standard Oil lubrication specialist recommended the use of STANWAY #95, a very stable oil having extreme oiliness and containing a tackiness agent. Result: smooth operation, complete elimination of chattering and scoring.

STANWAY Industrial Oils were developed to meet the extreme oiliness requirements of certain machine tools which customarily operate under very heavy loads. STANWAY Oils are part of a complete line of industrial oils, cutting oils and coolants that serve all industry.

No matter how "special" your problem may be, there's a Standard Oil product to solve it. There's also a near-at-hand Standard Oil lubrication specialist to help you select and apply the right one. To obtain his services call the Standard Oil office nearest you, or write Standard Oil Company, 910 S. Michigan Ave., Chicago 80, Ill.

STANDARD

STANDARD OIL COMPANY
(Indiana)

For more facts circle 545 on Reply Card

OPERATION—PRODUCTION

(O and P begins on page 56)

each per cent of entrained air. In general, there must be an adjustment in proportions of the aggregates (reduced sand content) or the reduction in strength will be greater.

6. Concrete should be placed, not poured. It is the amount of water that determines the strength of the resultant concrete. With the same proportions of cement and aggregate, one can get 1000 psi or 5000 psi at 28 days, depending upon amount of water used.

Jet Torch Cleaning for Castings

AN INGENIOUS METHOD, known as the Kwik-Arc Jet Torch process, has eliminated a former backlog of castings awaiting chipping and grinding at the ACCO Casting Div., American Chain & Cable Co., Reading, Pa.

Generating an electric arc of 6000 F, the jet torch consists of a ½-in.-diam carbon electrode, secured in a holder, with a small air jet nozzle beneath it. When the arc is struck, it melts flaws such as shrinks, cracks, fused-in sand, fins and brackets, and the accompanying jet of air blows the molten metal and slag away. The jetted area is allowed to cool and is then rebuilt with sound weld metal before the casting reaches the grinding operation.

Operator wields 6000 F jet torch to clean surface defects from large casting

In addition to its advantage in speeding up the cleaning operation, this process removes less parent metal than is removed with a chipping gun, and subsequent welding and grinding are minimized.

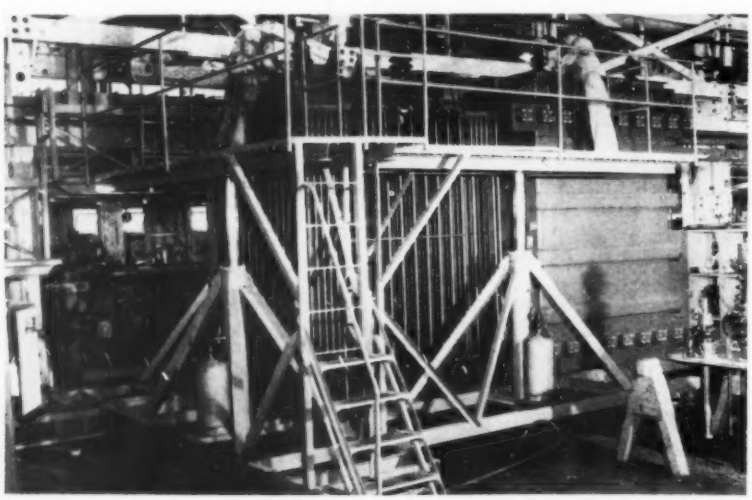
At ACCO, metal welding booths were erected to confine the operation, with its intense light and metal "splash." The operator wears a welder's helmet and protective clothing.

Adjustable-Height Work Platforms Enclose Transformer Assemblies

DESIGNED AND BUILT at the plant, adjustable platforms are used at the Sunnyvale, Calif., plant of Westinghouse Electric Corp. to facilitate assembly of large power transformers. More convenient than the wooden ladder-platforms formerly used, the assemblers also cite the additional safety features provided in the new platforms.

An hydraulic lift furnishes the necessary power to raise the height of the platforms from their minimum height of 6 ft 3 in. to maximum height, 10 ft.

Three of the platforms are equipped with casters and truck stops so that they can be moved into position readily. The remaining three, relatively immobile, are provided with feet only. These three are fitted with bins to hold hardware and fittings needed on the job, and they eliminate much of the climbing up and down frequently done on an above-the-floor assembly.



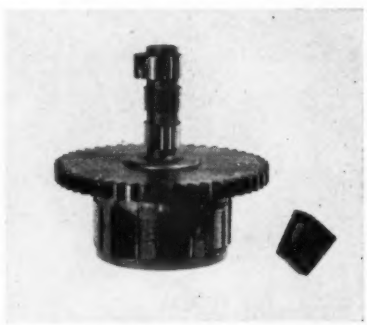
Two adjustable platforms in position at a transformer assembly operation permit the workers to move about easily and safely on two sides of the transformer

Permanent Magnets Simplify Generator Design

EIGHT CAST permanent magnets were key factors in the redesign of a small generator that had been both a production and a sales problem to the Whizzer Motor Co., Pontiac, Michigan.

Generators mounted on the outside of the motor assembly and operating off the flywheel of the company's product, motor bikes, were performing unsatisfactorily.

Noise and bearing wear, together with poor voltage regulation, were overcome by redesigning the generator. The new generator rotor is mounted on the engine cam shaft—a location made possible by the use of cast magnets produced by the Carboloy Department of General Electric Co. These magnets, cast with a small locking protrusion on their sides, are molded into a metal rotor, making it an integral part of the cam shaft.



Generator rotor cast on cam shaft, with permanent magnets (inset) in position

The new generator represents not only an improvement in appearance and operation, but has proved capable of supplying current for ignition, accessories and some battery charging.

Shop Drawer Lock

Contributed by H. N. Josleyn

LOCKING A SET of shop tool drawers with a single padlock can be facilitated with an easily-made extension device, adaptable to either metal or wooden drawer cabinets of various sizes.

A length of 16-gage strip is formed into a Z section of sufficient depth to clear the drawer ends when the draw-

Reglazing is 88% Labor—Save it!

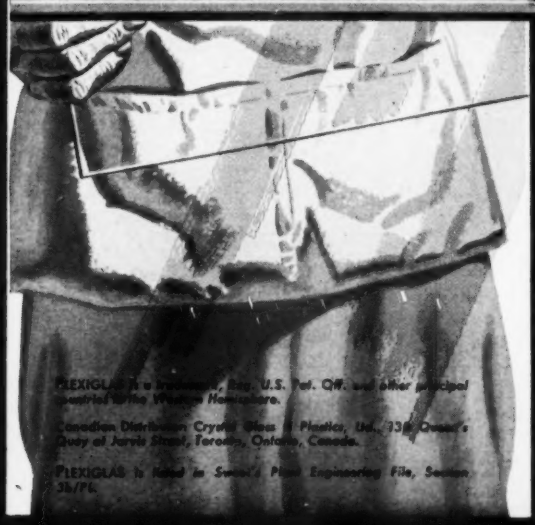
Glaze with PLEXIGLAS

Surveys on industrial glazing show that it costs $3.00, on an average, to replace a 12″ x 18″ pane. Labor and factory overhead account for $2.65 of this. The prevention of window breakage can mean an appreciable reduction in your maintenance costs.

A good way to prevent breakage is to glaze with durable PLEXIGLAS. This acrylic plastic is strong and resilient. It resists impact, vibration and twisting, the main enemies of industrial glazing.

PLEXIGLAS is supplied as clear material, and in translucent and transparent colors that can be used to diffuse daylight, cut down direct sky glare, or reduce solar heat.

We will be glad to send you the names of dealers in your vicinity.



PLEXIGLAS is an ACRYLIC PLASTIC. It should be installed and maintained as described in our brochure, "Window Glazing with PLEXIGLAS". Copies are available promptly on request.

CHEMICALS FOR INDUSTRY

ROHM & HAAS COMPANY

WASHINGTON SQUARE, PHILADELPHIA 5, PA.

Representatives in principal foreign countries

INSURANCE SAVINGS ALONE

will pay for an

ALGRIP

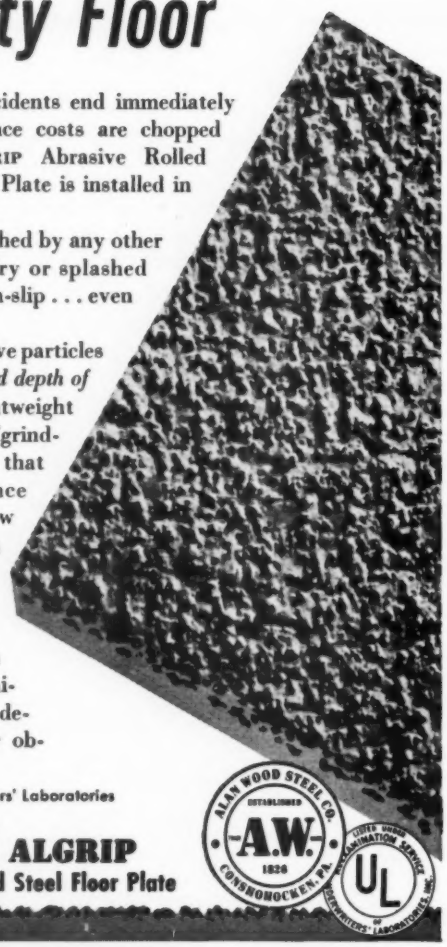
Safety Floor

Slipping accidents end immediately and insurance costs are chopped when ALGRIP Abrasive Rolled Steel Floor Plate is installed in any plant.

ALGRIP's safety is unmatched by any other material because wet, dry or splashed with oil, ALGRIP *stays* non-slip . . . even on steep inclines.

Hundreds of tiny abrasive particles impregnated *to a controlled depth of penetration* into tough, lightweight steel plate give ALGRIP a "grinding-wheel" grain surface that never wears smooth since hard use only exposes new gripping particles . . . an exclusive ALGRIP feature.

ALGRIP foot safety actually costs nothing, because it pays for itself in savings on insurance premiums. Write today for full details. There's no cost or obligation.



ALGRIP is Underwriters' Laboratories approved for safety.

A.W. ALGRIP
Abrasive Rolled Steel Floor Plate

ALAN WOOD STEEL CO. ESTABLISHED A.W. 1826 CONSHOHOCKEN, PA.

ALAN WOOD STEEL COMPANY
CONSHOHOCKEN, PA.

Please send Booklet AL-5 on how ALGRIP can cut costs and stop accidents.

Name_____ Title_____

Address_____

City_____ Zone_____ State_____

For more facts circle 547 on Reply Card

OPERATION — PRODUCTION

(O and P begins on page 56)

Extension locking device pictured with drawers closed, in locking position

ers are closed. Steel butt hinges are welded on one side of the offset section, and a hinged hasp is welded on the opposite edge at a location that will permit the slotted portion to fit between two of the drawers.

With the hasp in place, a hole is drilled through the body of the cabinet, to insert an eye bolt so positioned that the hasp slot will fit over the eye of the bolt for insertion of the padlock.

To increase the security of the arrangement, the hinges can be provided with non-removable pins, and the hinges can be fastened to the cabinet with flat head machine bolts riveted over the nuts.

Tap Grinding Jig Block

Contributed by A. E. Salmons

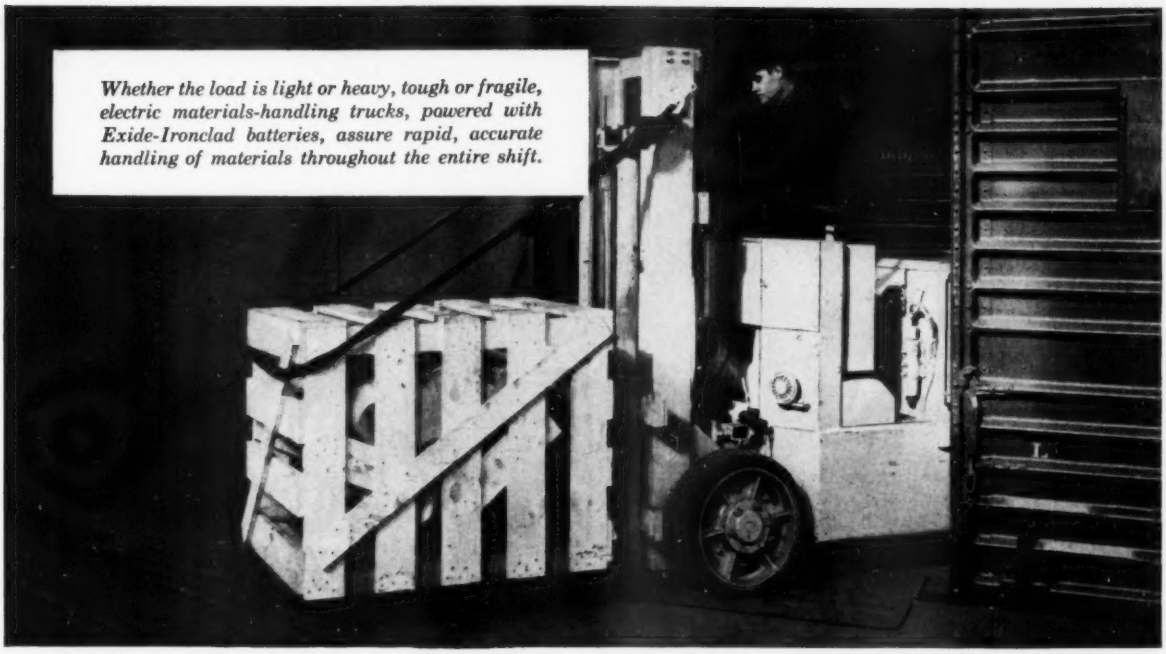
TAPPING an internal thread the full depth of a blind hole or tight against a shoulder was a problem in our shop that arose quite frequently. Difficulty in getting a good thread resulted from worn tap leads or broken leads, which prevented the thread being cut the full depth.

An attempted solution—grinding the end of the tap square while holding it in a vise—often produced an unsatisfactory job.

Designed specifically to hold the taps in true vertical alignment on a surface grinder, a jig built in the shop has solved the problem for our application. A shoulder, along the bottom of the block, will fit either directly into the

GET FULL SHIFT HANDLING, NO UNSCHEDULED DOWN TIME

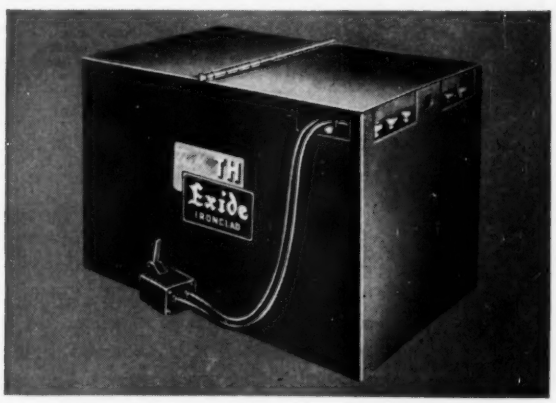
. . . with low cost Exide-Ironclad power!



Whether the load is light or heavy, tough or fragile, electric materials-handling trucks, powered with Exide-Ironclad batteries, assure rapid, accurate handling of materials throughout the entire shift.

YOU GET uniform performance throughout each shift when battery electric trucks are powered by Exide-Ironclads. Your trucks handle as much load during the last hour as during the first . . . with no unscheduled down time. Lower costs for operation, maintenance and depreciation make Exide-Ironclads your best power buy—AT ANY PRICE!

THE POSITIVE PLATES are the heart of any battery. Only Exide uses a slotted tube construction. By use of tubes, more active material is exposed to the electrolyte, providing *greater power*. Also, more active material is retained, giving *longer working life*.



THE NEW THRIFTY HAULER! The improved industrial truck battery. *Non-oxidizing* plastic power tubes assure longest battery life, more capacity in the same space. For full details, call your Exide sales engineer—write for Form 1982 (Installation and Maintenance of Motive Power).

Your best power buy
. . . AT ANY PRICE!

Exide®
IRONCLAD® BATTERIES

Exide INDUSTRIAL DIVISION, The Electric Storage Battery Company, Philadelphia 2, Pa. • *Exide Batteries of Canada, Limited, Toronto*

For more facts circle 548 on Reply Card

TOCCO Chose Reading Electric Hoists . . .

This Reading electric hoist is moving a sheet metal cabinet from a heating station to the production line. All Reading hoists at Tocco have the same two-button pendant control.

● Rapidly rising production goals are being met in Ohio Crankshaft's new Tocco Division plant in Cleveland's South Side . . . thanks partly to Reading Electric Hoists.

Tocco, a leading producer of induction heating equipment, designed the new plant to meet the needs of its rapid expansion. Pre-planned materials handling, involving trucks, bridge cranes and electric hoists, is paying off in fast, orderly movement of materials from operation to operation.

Playing a big role in this integrated handling system is a series of Reading electric hoists, "custom-built" from standard Reading units to meet the exact requirements of each operation. These hoists permit Tocco workmen to move all material without manual lifting.

Reading's unique "Unit Construction" plan offers you special equipment for your own plant at the low cost of standard parts. Investigate now this proven way to get faster, better materials handling. A note on your company letterhead will bring a Reading engineer to analyze your handling operations . . . at no obligation.

Reading Crane & Hoist Corporation, 3103 Adams St., Reading, Pa.

READING HOISTS

CHAIN HOISTS — OVERHEAD TRAVELING CRANES — ELECTRIC HOISTS

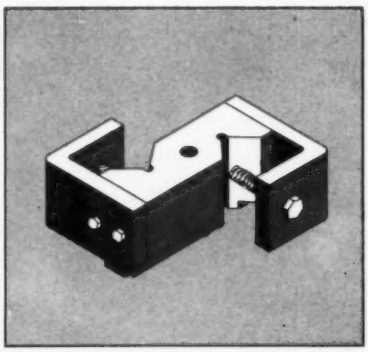
For more facts circle 549 on Reply Card

OPERATION—PRODUCTION

(O and P begins on page 56)

table slot on the grinder, or into a slotted adapter plate used on a magnetic chuck. A single bolt, inserted in the hole in the center of the jig block, holds the assembly in place on the grinder.

In position, the tap is held securely



Drawing illustrates construction simplicity of jig block. Size can be varied

by means of a C-clamp arrangement built into the block.

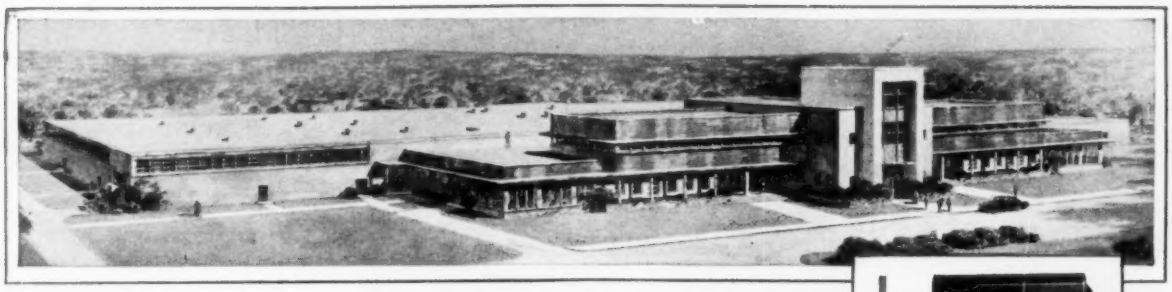
Cuts in the side of the block are 45 and 60 deg, to accommodate taps, round stock or hex stock, and the size of the block can be varied as necessary.

Powder-Actuated Tools Lighten Maintenance Chores

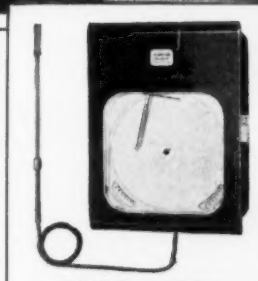
COSTS OF FASTENING drive pins or threaded studs into steel or cement have been cut in half in maintenance operations at the Glenn L. Martin Co. plant in Baltimore, through the use of powder-actuated tools and fasteners, according to plant engineer Fred W. Wilcox. They keep 10 tools busy around the clock, an installation which the tool manufacturer, Ramset Fasteners, considers the most extensive use of the powder-actuated system in maintenance work in the country.

More than 30,000 fasteners were used by Martin maintenance personnel last year, on jobs as widely varied as installing steel rails for plane assembly to erecting a wooden security fence, 950 ft long, around an area where highly classified government work is being done.

On this fence job, using a powder-actuated tool, one man fastened the base of the fence to the cement floor in a couple of hours—a job which would normally take three men a shift and a half. Using the men who would have been setting the base, along with other carpenters, the fence was erected



Another nationally-known Pharmaceutical Manufacturer chooses **JOHNSON CONTROL**

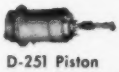


T-1000 Record-O-Stat

T-315 Submaster Room Thermostat

T-800 Capillary Thermostat

T-901 Submaster Thermostat



D-251 Piston Damper Operator

V-103 Coil Valve

White Laboratories, Inc., Kenilworth, New Jersey. A. M. Kinney, Inc., architects and mechanical engineers, Cincinnati, Ohio; Frank Briscoe Co., Inc., general contractor, Newark, New Jersey; Frank A. McBride Co., heating, ventilating and air conditioning contractor, Paterson, New Jersey.

In the modern new plant of White Laboratories, Inc., diversified control problems are automatically solved with precision by a comprehensive system of Johnson Control. A "Planned-for-the-Purpose" Johnson System automatically regulates temperatures to meet the requirements for processing pharmaceuticals and to insure worker comfort.

In the office section, Johnson Submaster Room Thermostats, reset in accordance with outdoor temperatures, regulate Johnson Double Mixing Dampers to maintain exactly the desired conditions. Throughout the Main Building and in the Chemical Building, Johnson Thermostats control Johnson Valves and Damper Operators on central fan heating and ventilating units.

Much of the processing and many of the manufacturing areas are controlled by Johnson Series T-1000 "Record-O-Stats", temperature controllers which also provide a continuous record of temperatures for future reference. This is important where processes and product quality are dependent upon precise temperatures . . . another outstanding example of the adaptability of Johnson Control.

Whether the solution of your control problem requires the application of a single controller or the installation of an intricate temperature and humidity control *system*, let a Johnson engineer help you. Get the benefit of 65 years of experience by the *only* nationwide organization devoted exclusively to manufacturing, planning and installing automatic temperature and air conditioning control systems. JOHNSON SERVICE COMPANY, Milwaukee 2, Wisconsin. Direct Branch Offices in Principal Cities.

JOHNSON *Automatic Temperature and Air Conditioning* **CONTROL**

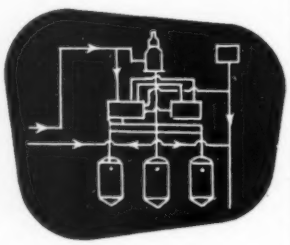
MANUFACTURING • PLANNING • INSTALLING • SINCE 1885

For more facts circle 550 on Reply Card

How to select a PROTECTIVE COATING

CHECK RESISTANCE TO CORROSIVE MEDIA

How well a coating withstands the action of a given corrosive agent is the first factor you must necessarily consider in choosing the right coating for your needs — but it's *only* the first.



CHECK ADAPTABILITY TO SERVICE CONDITIONS

The second factor — and one you can't always predetermine by laboratory test — is on-the-job performance. That's governed, in turn, by the kind of metal you're protecting . . . the condition of the surfaces . . . how the equipment is constructed . . . conditions encountered during its operating cycle . . . during idle periods — considerations that must be surveyed in detail before you can select a protective coating with reasonable assurance it will successfully meet your requirements.

Dampney equipment-engineered coatings give you that assurance because they are formulated to do certain selective, specialized jobs both large and small, difficult and routine — to give you the protection that is right for you — not in a costly, custom-made material nor an all-purpose anti-corrosive, but in a coating *engineered for the equipment it is to protect.*

Dampney's industrial equipment knowledge is yours to call upon freely. Let us put it to work on your next coating problem.

MAINTENANCE FOR METAL

THE DAMPNEY COMPANY

BOSTON 36, MASSACHUSETTS

140-1

For more facts circle 551 on Reply Card

OPERATION—PRODUCTION

(O and P begins on page 56)

in a day and a half, or approximately the same time it would have taken to fasten the base with conventional methods.

In another application, more than 5000 ft of steel rails were fastened into floor channels with the tools. These rails support work fixtures on which Navy flying boats ride as they are moved along the assembly line.

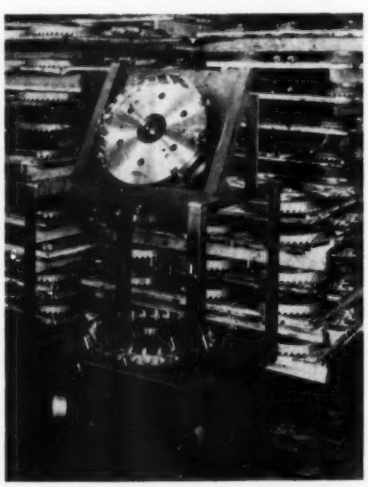
To provide additional floor space, balconies have been constructed in the plant. The 3-in. planking on the balcony floors was fastened with 6-in. studs driven with a Ramset fastener through 2-in. by 4-in. lumber into ⅜-in.-thick supporting H-beams. In this instance, the powder-driven fasteners eliminated three drilling operations formerly necessary before bolts could be set to secure the planking, according to the plant maintenance superintendent.

One of the biggest jobs which the Martin maintenance department has done with the tools has been securing metal catch basins which fit under hull docks of the P5M Martin flying boats as the planes undergo water testing.

One man can fasten a catch basin, approximately 75 ft in diameter, in one working day—a saving of three men's time for two working days.

Table Transports Gear Cutter

SAFE HANDLING and positioning of heavy, hard-to-handle, razor-sharp gear cutters presented a problem for the Axle Division of Eaton Mfg. Co., Cleveland. The tool, used on a gear cutter, is employed for cutting gears



Gear cutter gets transportation, protection, position on caster-mounted table

TESTS *PROVE*

NORGREN MICRO-FOG

DELIVERS LUBRICATING FOG AFTER TRAVELING THROUGH 130 FT. OF HOSE

One of the many important advantages of Norgren Micro-Fog is its ability to travel longer distances...a feature which assures absolutely uniform distribution of lubricant through as many as 40 outlets. This reduces lubrication costs and permits greater flexibility in product design and plant layout.

PIONEER AND LEADER
IN OIL FOG LUBRICATION
FOR **26** YEARS

VALVES • FILTERS • REGULATORS
LUBRICATORS • HOSE ASSEMBLIES

FEATURES OF NORGREN MICRO-FOG LUBRICATORS FOR BEARINGS • GEAR BOXES • CHAIN DRIVES

- **VISIBLE OIL FEED**
- **CONSTANT OIL LEVEL**
  Rate of feed is not affected by oil supply.
- **OIL FEED CONTROLLED BY AIR**
  Gives accurate control and uniform rate of feed.

WRITE FOR NEW CATALOG No. 600

Micro-Fog Lubro-Control Unit for bearings, spindles, gear boxes.

Micro-Fog Lubro-Control Unit for tools and cylinders requiring regulated air pressure.

Vitalizer Unit for tools, cylinders, etc.

Micro-Fog Lubricator, tank type, 1¾ gal. cap.

C. A. Norgren® CO.
3443 So. Elati, Englewood, Colo.

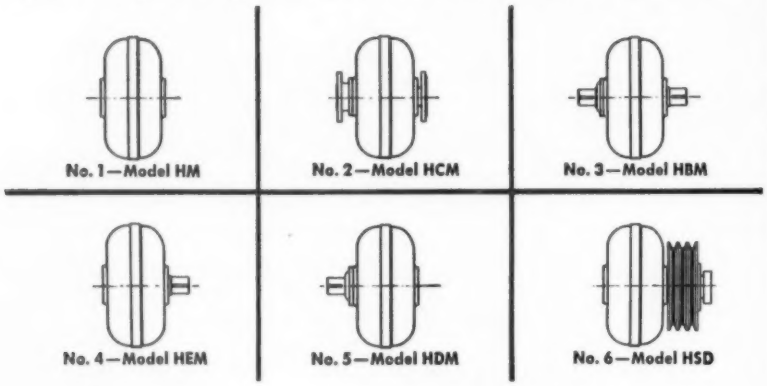
For more facts circle 552 on Reply Card

Which fluid drive is best for your job

With maintenance and downtime costs — from overloading powered equipment—standing out like a sore thumb in today's profit picture, the protection provided by fluid drives becomes critically important.

But the problem frequently arises: *which* model Fluid Coupling should be used? Twin Disc offers six different models, for motors or engines from ¾ to 700 hp, with a variety of input and output arrangements to fit any installation. *All* models prevent motor burn-outs or engine lugging—deliver full output torque in either direction—and permit motor or engine selection on economical basis of *running* requirements.

Thus the answer to *which* Fluid Coupling is your Authorized Twin Disc Hydraulic Dealer . . . backed by Twin Disc field engineering service. Consult your Dealer, or write Dept. DS, Racine, Wisc., for full details.



1 Basic Fluid Coupling unit with two support bearings. No input drive flange or output shaft. Sizes 14.5, 17.5, 21, 27.

2 Provides input impeller flange, flanged output shaft—both suitable for use with two halves of double engagement gear-type flexible coupling. Sizes 12.2, 14.5, 21.

3 Provides input stub shaft, straight output shaft, for use with standard Thomas Flexible Couplings on both input, output ends. Sizes 14.5, 17.5.

4 Provides straight output shaft. Permits use of special Thomas Flexible Coupling on input side; standard flexible coupling on output side. Sizes 14.5, 17.5, 21, 27.

5 Provides input stub shaft, permitting customer to make special output shaft to own specifications and use any type standard double-engagement flexible coupling on input side. Sizes 14.5, 17.5.

6 Provides input sleeve bored for standard NEMA motor shafts; tapered hub fits wide range of sheave diameters. Sizes 7.4S, 7.4, 8.4, 9.5, 10.6, 12.2.

TWIN DISC
CLUTCHES AND HYDRAULIC DRIVES

TWIN DISC

TWIN DISC CLUTCH COMPANY, Racine, Wisconsin • HYDRAULIC DIVISION, Rockford, Illinois

Branches or Sales Engineering Offices: Cleveland • Dallas • Detroit • Los Angeles • Newark • New Orleans • Seattle • Tulsa

For more facts circle 553 on Reply Card

OPERATION — PRODUCTION

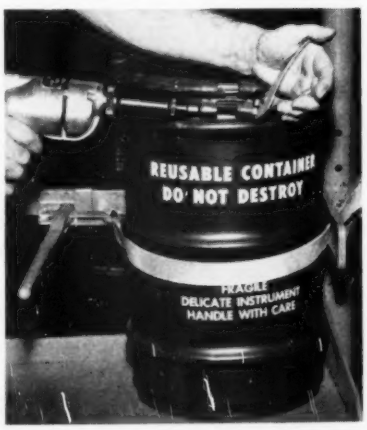
(O and P begins on page 56)

used in the manufacture of truck axles.

Weighing approximately 200 lb, the 18-in. cutter is too heavy, and its teeth too sharp for safe manual handling. And, since the cutter must be presented for loading on the machine in a prescribed position, a castered table was designed for the specific application. The cutter is carried at the right height and in the correct position to be engaged by a swinging arm on the machine, which positions the tool.

The tilted cutter support on the table is framed by wooden retainer strips to protect the tool blades against nicking.

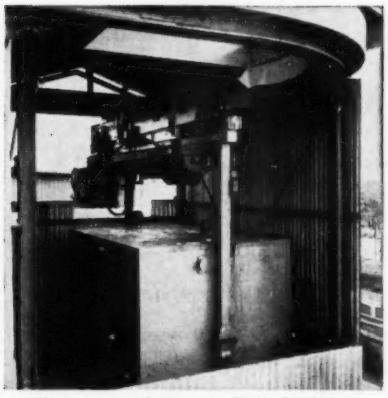
Improved Method of Opening Containers Pays Dividends



Improved method of opening reusable containers is time-saver for Convair's San Diego Div. The old way of getting to drum contents made use of pliers and manual screwdriver and took about 14 min. In present system, an electric screwdriver and pliers are applied after container has been strapped in a rack, cutting opening time down to 4 min.

AUTOMATIC "UP AND OVER" TRANSFER

Three boxes—450 lbs. each—are loaded in car. When doors are closed the car raises to carrier.

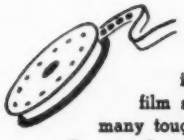


When car reaches upper limit, the Mono-Tractor propels carrier on the MonoRail to No. 2 mill.

SAVES $30,000 PER YEAR

Here is an "Up-and-Over"* system that eliminates 72 hours of handling labor per day. It automatically transfers 180 full bobbin boxes from three floors of one mill to one floor of another and returns the empties. Estimated savings in labor, trucks, floors and traffic congestion run upwards of $30,000 per year.

It is another of the many examples of American Mono-Rail engineering for low-cost handling within space limitation. Let one of our field representatives explain further the versatility and low maintenance of American Mono-Rail equipment.



***"UP-AND-OVER"**

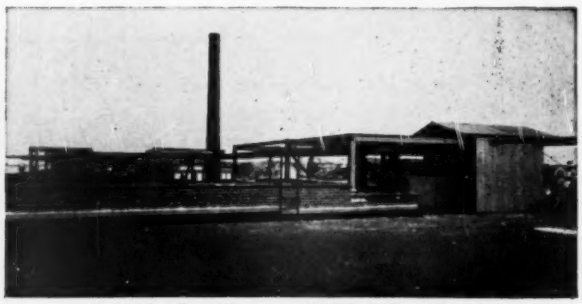
is the title of our 16-mm. sound film showing how MonoRail solves many tough handling problems. Please allow us three weeks to schedule showing.

AMERICAN OVERHEAD HANDLING EQUIPMENT

MONORAIL COMPANY

13123 ATHENS AVENUE • CLEVELAND 7, OHIO

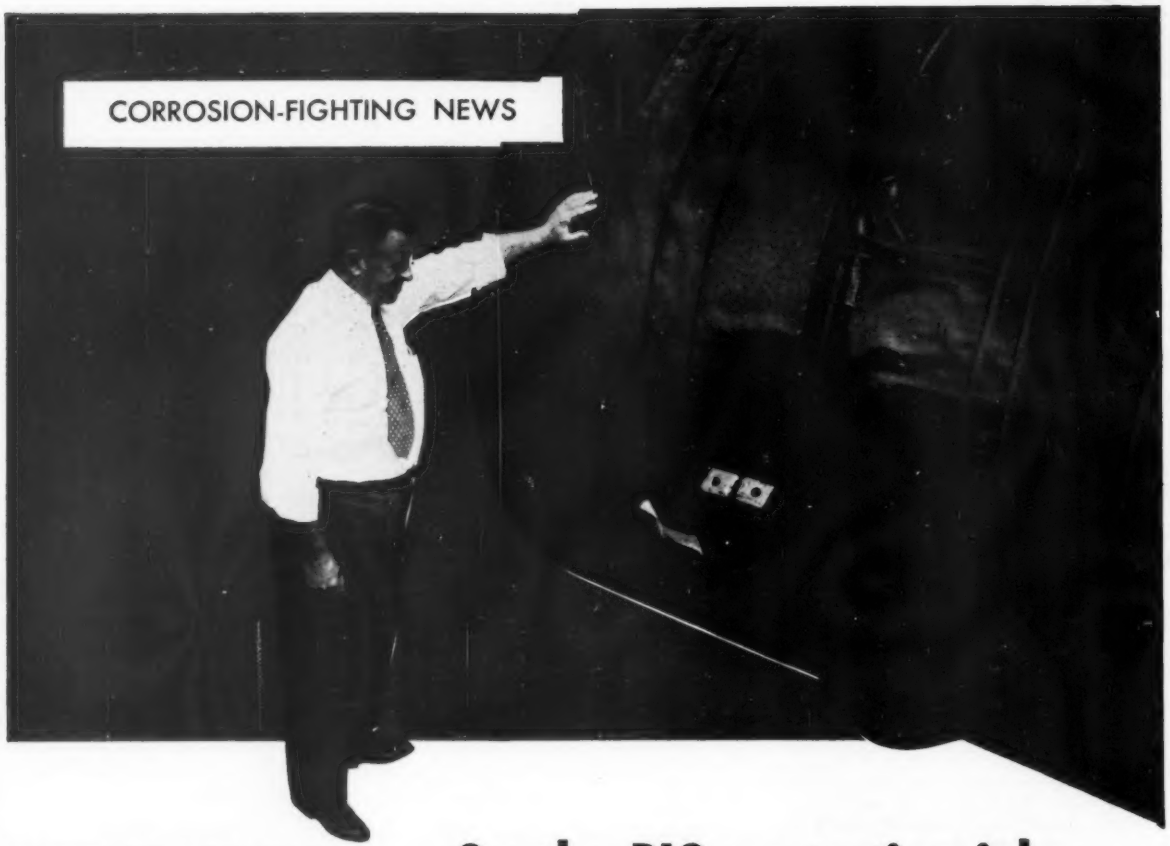
Carrier travels at 50 f.p.m. around curves—150 f.p.m. on straight track with slow approach at towers.



At No. 2 mill car lowers to third floor for delivery of full boxes and return dispatch of empties.

For more facts circle 554 on Reply Card

CORROSION-FIGHTING NEWS



On the BIG protection jobs PITT CHEM gets the call

Positive protection against underground corrosion was a "must" on the installation of these vital 84-inch headers and 48-inch cooling water pipes at the Lewis Flight Propulsion Laboratory of the National Advisory Committee for Aeronautics, Cleveland, Ohio. This assured protection was provided by Pitt Chem Tar Base Coatings, which were specified by the project's engineers, H. K. Ferguson Co., Cleveland, and applied by the fabricators of the pipe, Bethlehem Steel Corp.

The distinct advantages of Pitt Chem Tar Base Coatings may solve many of your toughest corrosion problems:

1. They are made from one of the most impervious of all materials—cold tar pitch.
2. They are easy to apply, by brush or spray.
3. Their applied film is up to ten times as thick as ordinary paint.
4. They provide better protection-per-dollar than any other coatings available.

Our staff of corrosion engineers is at your service. Why not let one of them talk over your corrosion problems? Write today.

WAD 5128

PITT CHEM 101—For Severest Conditions
PITT CHEM 102—Maintenance Coating
PITT CHEM 103—General Purpose Coating
PITT CHEM 104—Potable Water Service
PITT CHEM 105 AQUATAR—A Water Dispersion
PITT CHEM 106 TARMASTIC—Sealing Mastic
PITT CHEM 107 PACHKOTE—Specialty Coating
PITT CHEM 110—Coating Sealer

PITTSBURGH
COKE & CHEMICAL CO.

COAL CHEMICALS • AGRICULTURAL CHEMICALS • FINE CHEMICALS • PROTECTIVE COATINGS • PLASTICIZERS • ACTIVATED CARBON • COKE • CEMENT • PIG IRON

For more facts circle 555 on Reply Card

CONSTRUCTION BRIEFS —a review of fundamentals for the plant engineer

Prepared by Byron A. Engelbach, Plant Engineer

SECTION MODULUS

EXPRESSED SIMPLY, the *Section Modulus* is the factor I/n in the Bending Moment Formula B.M. = fI/n and is expressed in inches^3, and is the measure of a capacity of a section to resist a bending moment. Some handbooks refer to this expression as the *Section Factor*.

There are certain loadings and cross-sections of beams that occur frequently and for these, tables of safe loads have been worked out and may be found in many engineering handbooks. However, for the beam which is non-uniformly loaded, or a beam of irregular cross-section, it is impractical to compute tables for strength, because in each case the values must be computed by determining either the section modulus or the maximum bending moment.

Tabular Information

Engineering handbooks and those handbooks provided by various steel companies give tables presenting the Section Modulus for various standard sections such as rectangles, structural angles, channels, I-beams, etc. Practical use of these tables by the structural designer is advisable. In cases where tables are not available the designer must then compute results by formulae.

By means of formulae, the bending moment may be computed when the load on a beam is known. It then becomes a simple matter to calculate the section modulus by dividing the bending moment by the "allowable safe fiber stress." The size of the beam required is then found by locating in the tables a section modulus equal to or slightly greater than the computed factor.

Beam Selection Procedures

Various steel handbooks have tables which present several economical beam sections for meeting specific section moduli. These tables can save considerable time in selecting the most efficient beam to meet a specific case.

Strength of a Beam

Actually, the required safe strength of a particular beam of a specified length depends on the load that it will carry. The bending moment for a beam of given length varies with the imposed load.

It then follows that the bending moment varies with the section modulus. The greater the section modulus, the greater the allowed load and the strength of the beam.

Example: Assume that a rectangular beam 6 in. by 12 in. is to be considered. First find the section modulus for the beam when placed on edge as in Fig. 1A and then compare this with the section modulus when the beam is laid on its side as in Fig. 1B.

Solution:

Use the formula

$$\text{B.M.} = f\frac{I}{n} = f \times (\text{Sect. Mod.})$$

$$\text{Then } I = \frac{b(h)^3}{12} = \frac{6 \times (12)^3}{12} = 864$$

$$\text{Therefore Sect. Mod.} = \frac{I}{n} = \frac{864}{6} = 144 \quad \text{(Fig. 1A)}$$

$$\text{Then } I = \frac{12 \times (6)^3}{12} = 216$$

$$\text{Therefore Sect. Mod.} = \frac{216}{3} = 72 \text{ (Fig. 1B)}$$

By comparison, the example in Fig. 1A shows the section modulus to be twice as great as in the case of Fig. 1B. This indicates that the beam is twice as strong.

Problem No. 1. Select the economical size of steel I-beam which spans 18 ft, rests on end supports in a free manner and carries 30,000 lb uniformly distributed.

Data: Refer to Fig. 2. Safe allowable fiber stress to be 16,000 psi. Weight of beam to be considered.

Solution: From structural handbook find that the bending moment formula for this type of beam and loading is $\frac{W1}{8}$ where W equals 30,000 lb and 1 equals 18 ft.

$$\text{Then: } \frac{W1}{8} = f \times (\text{Sect. Mod.})$$

By substitution:

$$\frac{30{,}000 \times 18 \times 12}{8} = 16{,}000 \times (\text{Sect. Mod.})$$

And Section Modulus = 50.6 (approximately)

Refer to the AISC or Pocket Companion Steel Handbook and in the table titled "Economy for Selection of Sections used as Beams" find a section modulus the same or slightly higher in quantity than the calculated 50.6. Opposite 51.9 in Column No. 1 find under heading "First Selection" a beam designated as 16 in. wide flange 36 lb.

Since the load to be carried must include the weight of the beam then the actual total uniform load must be 30,000 + (18 × 36) = 30,648 lb.

It is now necessary to check the allowable fiber stress with the actual fiber stress developed. Using the same formula, and substituting:

$$\frac{30{,}648 \times 18 \times 12}{8} = f \times 50.6$$

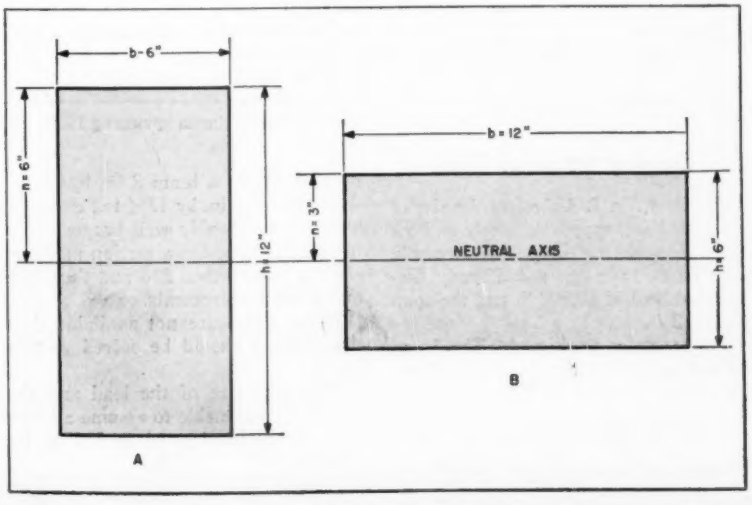


Fig. 1. Cross sections of beam in vertical (A) and horizontal (B) positions show relation of beam position to strength. Section modulus of vertical beam is twice that of horizontal beam; beam 1A has twice the load-carrying capacity of beam 1B

Therefore f = 16,353 lb which is in excess of the 16,000 allowable fiber stress. This indicates that a larger size beam should be selected. In the same handbook and table, opposite 58.2, the next higher section modulus finds as a first selection a 16 in. wide flange 40 lb beam.

This beam should be checked for stress.

$$\frac{(30{,}000 + 720) \times 18 \times 12}{8} = f \times 58.2$$

Therefore f = 14,252 lb which is well on the safe side below the 16,000 allowable stress indicating this is the proper beam to select in this case.

Solving for Safe Load

Problem No. 2. Determine the concentrated load which a 10 in., 23 lb I-beam will carry on a 12-ft span, end simply supported in a free manner.

Data: Refer to Fig. 3. Safe allowable fiber stress is 16,000 lb.

Solution: The beam will weigh 23 × 12 = 276 lb.

This is a uniformly distributed load which is equivalent to a concentrated load of half the intensity or 138 lb. From the structural handbook the bending moment formula for such a case, i.e., a concentrated load and free end support of beams $\frac{W1}{4}$ where W = the total concentrated load or W plus 138, and 1 = 12 ft. From the Tables of Properties of Beams, the section modulus of this beam is 22.6.

By substitution in the bending moment formula:

$$\frac{(W + 138) \times 12 \times 12}{4} = 16{,}000 \times 22.6$$

$$\text{Therefore } W + 138 = \frac{16{,}000 \times 22.6 \times 4}{12 \times 12}$$

W = 9,906 lb (approx.)

Solving for Beam Size

Problem No. 3. Calculate the size of a simple beam supported freely on both ends, considering only the strength. The beam to carry a uniformly distributed load of 12,000 lb and the span to be 12 ft.

Data: Refer to Fig. 4. The beam to be long leaf yellow pine. Safe allowable fiber stress to be 1000 psi.

Solution: The section modulus for a rectangular beam is $\frac{bh^2}{6}$. This should be used in the solution of this problem.

By substitution in the bending moment formula:

$$\frac{12{,}000 \times 12 \times 12}{8} = 1000 \times \left(\frac{bh^2}{6}\right)$$

Therefore $bh^2 = 1296$

Section Modulus = 216

The quickest method of solution for beam size is to use the AISC Handbook and in the table titled "Properties for Designing Timber" find the suitable beam. It will be found that a beam 6 in. by 16 in. dressed to 5½ in. by 15½ in., or a beam 8 in. by 14 in. dressed to 7½ in. by 13½ in., either of which is reasonably well proportioned in cross-section, has a section modulus slightly higher than 216 and therefore meets the requirements.

If the tables are not available then the problem should be solved as follows:

From the size of the load and the span it is reasonable to assume a beam 6 in. by 14 in. dressed to 5½ in. by 13½ in.

Then $bh^2 = 5.5 \times 13.5 \times 13.5 = 1002.0$ (approx.)

This figure is less than the 1296 calculated required amount indicating that the beam is too small for the job and the next larger size is needed.

In the interests of flexibility, it may be wise to choose two or more combinations of height and width measurements of beams that will provide the required strength. With these several solutions, the most efficient beam can be chosen.

Next assume a beam 6 in. by 16 in. dressed to 5½ in. by 15.5 in.

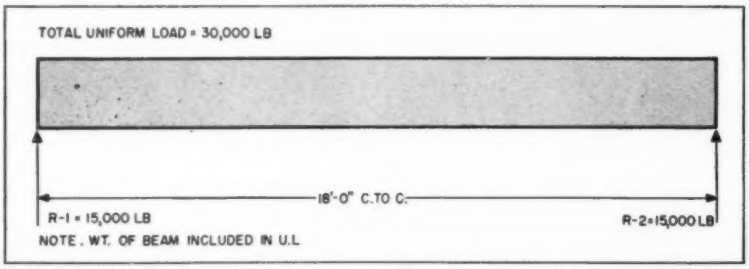


Fig. 2. Steel I-beam carrying an imposed load of 30,000 lb plus beam weight

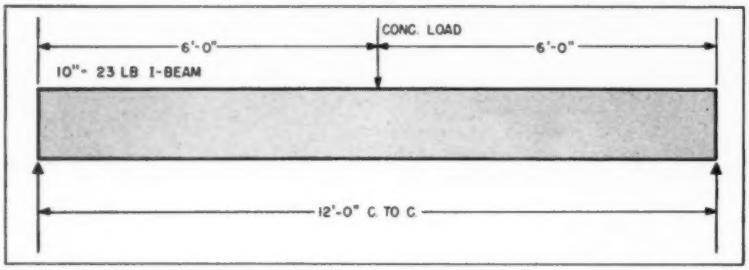


Fig. 3. Steel I-beam spanning 12 ft. The safe loading limit is to be determined

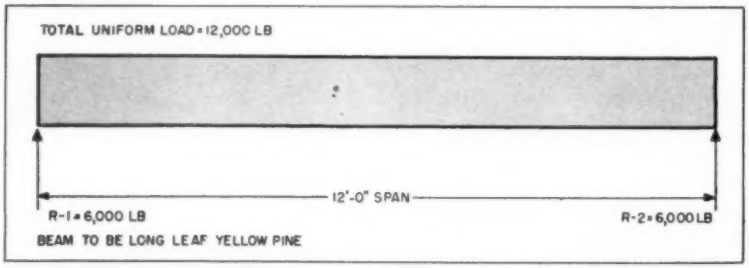


Fig. 4. Wooden beam spanning 12 ft, carrying 12,000 lb. Beam size to be determined

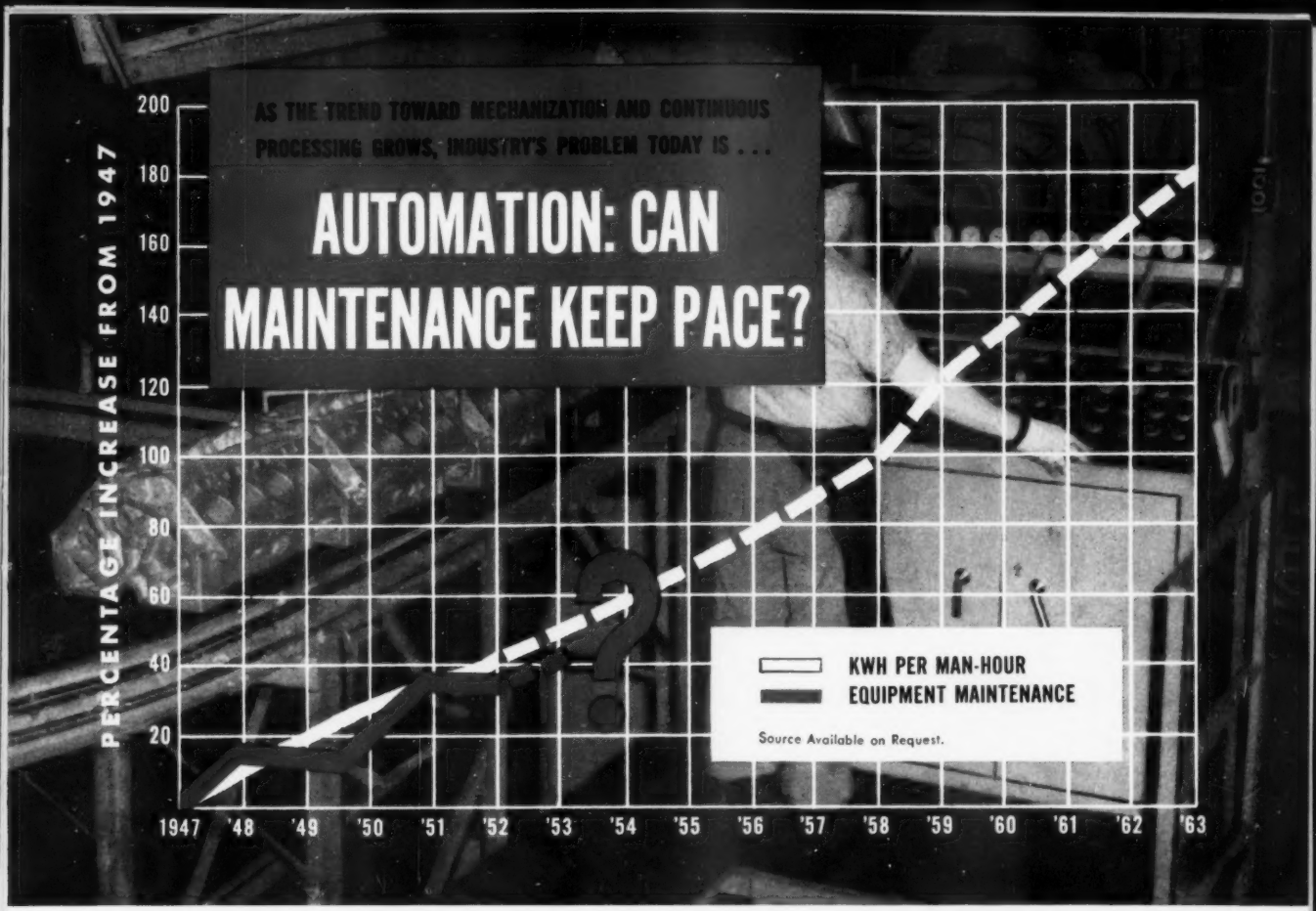
Then $bh^2 = 5.5 \times 15.5 \times 15.5 = 1321$ (approx.)

In addition, assume a beam 8 in. by 14 in. dressed to 7½ in. by 13.5 in.

Then $bh^2 = 7.5 \times 13.5 \times 13.5 = 1367$ (approx.)

Either beam, the 6 in. by 16 in. or the 8 in. by 14 in. beam meets the requirements. Actually the 6 in. by 16 in. beam is the most efficient beam to use since 1321 is closer to the calculated 1296 required to carry the load. However, due to the lumber situation or perhaps due to other phases in the problem of designing the structure the 8 in. by 14 in. beam can be used with almost the same efficiency.

For more facts circle 556 on Reply Card——→



One answer is General Electric's 5-step *Productive Maintenance* plan

- **More is expected from maintenance as industry continues its drive to reduce product costs**
- **And as kilowatt-hours per man-hour hit new peaks, trends toward automation are forcing a closer look at maintenance procedures**
- **But 9 out of 10 electrical maintenance programs are obsolete in one area or another**
- **To help maintenance keep pace, General Electric offers a 5-step *Productive* Maintenance plan**

In every industry, operations are constantly being made more efficient to increase output, quality, and reduce product cost. Plant electrification is expanding . . . more continuous processing lines are being set up . . . the first steps toward automation are being taken.

To help reduce product cost, similar planning and new techniques must be applied to maintenance. For this reason, General Electric has worked out a step-by-step plan called "Productive Maintenance." With it, you can organize an electrical maintenance program that will measure up to the constant drive for more production at lower cost.

Notice that G.E.'s plan is called *Productive maintenance*, and not preventive maintenance. There's a big difference. Maintenance must go beyond any negative concept . . . to where it is fully as important as production itself.

SEE THE NEXT 7 PAGES for the five basic steps in every *Productive* Maintenance Plan, specially designed to help you deliver more production for every maintenance dollar.

GENERAL ELECTRIC

TURN PAGE FOR 5-STEP PLAN

G.E.'s *Productive Maintenance* Plan

STEP 1 Gather complete equipment data

Start your *Productive Maintenance* plan by making a complete equipment inventory. The resulting record system will be a basic part of your entire new maintenance program

As your first step, determine *what* electrical equipment you have in your plant and *where* it is. An inventory number should be assigned. Usually, a system that indicates building, floor, and machine number is used conveniently for this purpose.

HERE'S WHAT YOU MUST KNOW. A well-edited record sheet or card should include a description of the equipment, application, rating, serial number, manufacturer, purchase order number, inventory number, and cost information.

TO BE EFFECTIVE, a Productive Maintenance Plan begins with a complete inventory of all plant equipment.

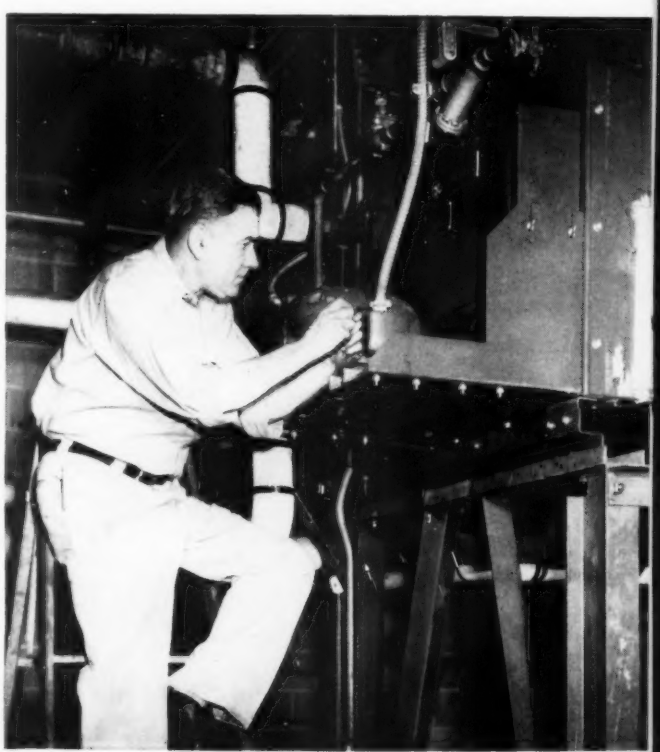
G.E.'s *Productive Maintenance* Plan

STEP 2 Determine extent of routine maintenance

Determine the amount of maintenance necessary for your electrical system. Some equipment will be excluded from the plan

Select equipment on which maintenance effort is to be expended in your program. Include only those items where *Productive* Maintenance will pay, or help make workers safe.

Anybody can do a complete routine maintenance job—but it may be unnecessarily expensive. In some cases, it will be cheaper to replace or repair a part or the entire piece of equipment after it breaks down, rather than use high-cost manpower to inspect and maintain it. Equipment that is not considered important enough to be brought into the *Productive* Maintenance plan can be repaired in answer to non-scheduled requisitions by production supervisors.



NON-CRITICAL EQUIPMENT, such as the motor for this air-conditioning unit, may not warrant being included in the plan.

G.E.'s *Productive Maintenance* Plan

STEP 3 Establish a routine operating control system

Put the equipment data you gathered in Step 1 to work. Use it to set up inspection schedules, work orders, renewal parts stocking system and to record costs

WORK OUT YOUR INSPECTION CYCLE. Consider the duty and application of all equipment. Then strike an inspection balance between "too often," with resultant waste of money, and "not often enough," with the possible damaging equipment outages that occur. The repair record will tell if more attention is needed. Ask your maintenance men to note on their check lists or report forms whether the frequency of inspection can be increased or decreased.

DEVELOP A WORK ORDER PROGRAM for routine maintenance work. Although there is no such thing as a universal work order (each plant must develop its own) certain essential information should be included on each. The work order ought to include a job number, job location, department number for charging purposes, the craftsmen required, the date required for completion, a description of the work to be done, an estimated and actual cost for labor and materials, and approval spaces.

GET RENEWAL PARTS RECOMMENDATIONS. Have your electric equipment manufacturer study the equipment recorded in your file. He will recommend the type and quantity of renewal parts you should stock. List these parts on the record card so the responsible maintenance man can determine immediately what parts are authorized for stock, and can identify these parts by number.

SET UP AN INVENTORY CONTROL SYSTEM. Estimate the approximate turnover rate for each part, procurement time, and the cost of acquisition to determine the minimum stock level to act as a reorder signal. To prevent duplication of identical parts sold under different numbers by different suppliers, cross-reference the parts numbers, and maintain the stock under only one number.

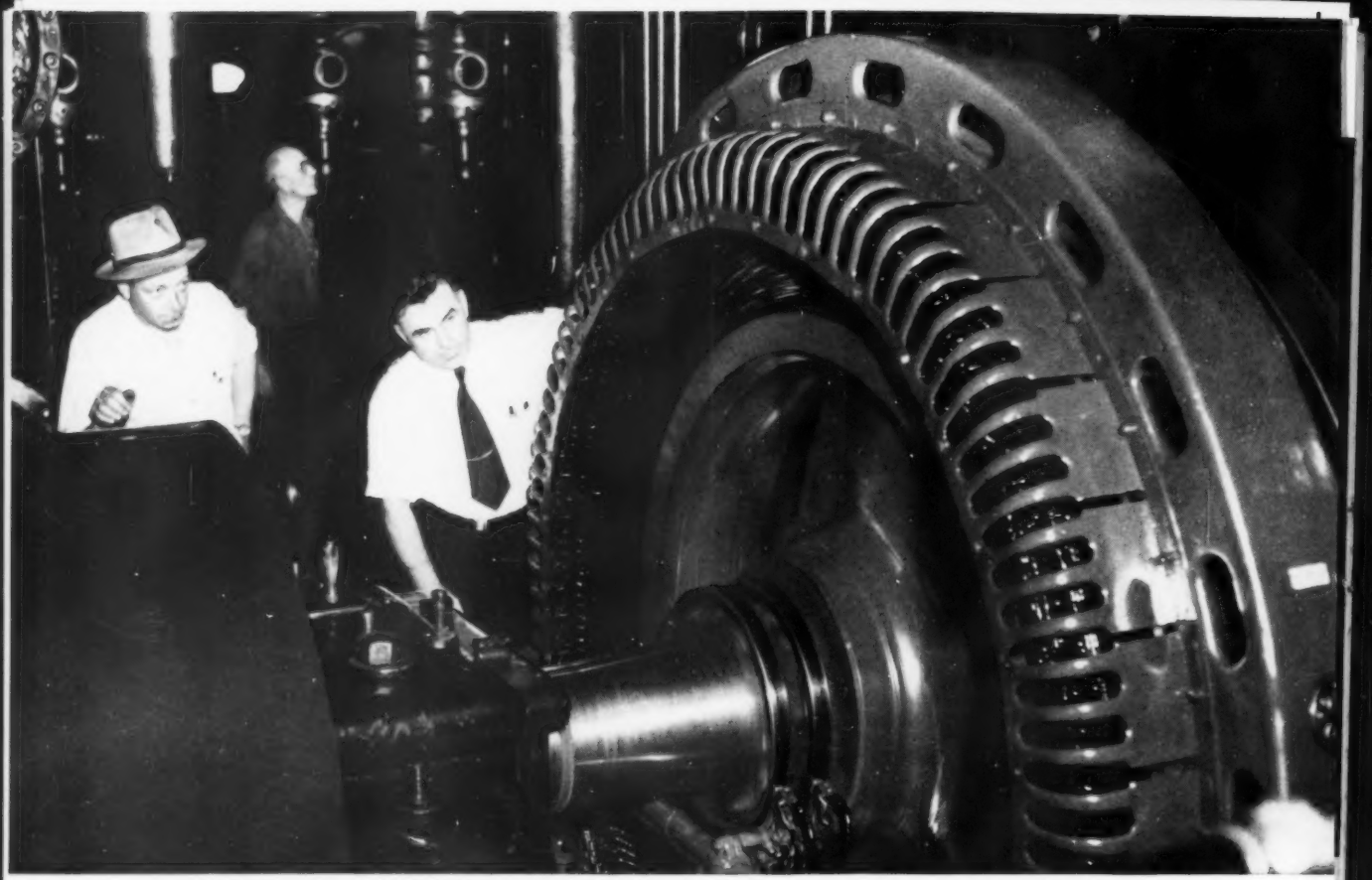
PURCHASE PARTS FROM ORIGINAL SUPPLIER—it's the best practice. The original supplier will have a greater interest and responsibility in the equipment operation. Parts will be the same dimensions, will have the same or better quality, and will be constructed to take advantage of recent engineering advances.

THE HEART OF ROUTINE MAINTENANCE is the keeping of proper, up-to-date records and paper work.

THE RECORD OF LOST TIME will tell you if inspection is balanced between "too often" and "not often enough."

GENERAL ELECTRIC

TURN PAGE FOR STEP 4



YOUR EQUIPMENT SUPPLIER will help you determine the condition of units on your critical list.

G.E.'s *Productive Maintenance* Plan

STEP 4 Evaluate for critical maintenance

List all equipment vital to production and inspect it thoroughly. Then, determine the critical-parts protection you need for each key machine

Close co-operation between Production and Maintenance Departments is necessary to determine what electrical equipment is vital to production. Together, these two groups must evaluate the functional importance and duty cycle of all electrical equipment included in your *Productive* Maintenance program.

WHEN IS EQUIPMENT CRITICAL? When its failure directly or indirectly interrupts or delays production. This is appraised by such things as high percentage of utilization, or lack of bypass equipment. Set up this list of equipment in order of importance.

INSPECT ALL EQUIPMENT on this critical list. Your equipment supplier, who has wide experience with his equipment under every type of operating condition, can help you determine the condition of critical units. Consider such things as age, duty-cycle, surges, and overloading. Based on this inspection, make a list of equipment on which the probability of breakdown is high. You will need this information to set up a planned overhaul schedule as discussed in Step 5.

HOW MUCH PROTECTION do you need for each key piece of equipment? The following steps will help you arrive at an answer to this question:

1. Calculate repair time under the following conditions assuming major failure:
   a. No critical parts stocked
   b. Some critical parts stocked (such as coils)
   c. All critical parts stocked (such as complete armature)
   d. Complete unit stocked
2. Determine cost of repair and inventory for each of the possible conditions.
3. Total this information to determine the total "failure cost."
4. Analyze total cost for each condition to determine what you must stock to protect the equipment.

The sample analysis chart at right shows you the factors involved in determining the best degree of protection at the lowest cost for each piece of critical equipment on your list.

Here is an example of how a *Productive Maintenance* analysis determined the best over-all protection for one specific motor doing one specific job:

EVALUATION OF CRITICAL PARTS PROTECTION REQUIREMENTS

(The evaluation is based on the failure of a part which requires the longest repair time, such as armature coils)

	NO CRITICAL PARTS STOCKED	ARMATURE COILS STOCKED	COMPLETE ARMATURE STOCKED	COMPLETE MOTOR STOCKED
REPAIR TIME	10 days to make coils X	6 days to rewind armature X	7 hours to install new armature	3 hours to replace motor
TOTAL DOWNTIME COST	$168,000	$100,800	$4,900	$2,100
COST OF PARTS PROTECTION	0	Coils: $4,664	Armature: $25,600	Motor: $46,000
COST OF REPAIR	$12,730	$5,900	Installation: $850	Installation: $360
TOTAL FAILURE COST	$180,730	$111,364	$31,350*	$48,460*

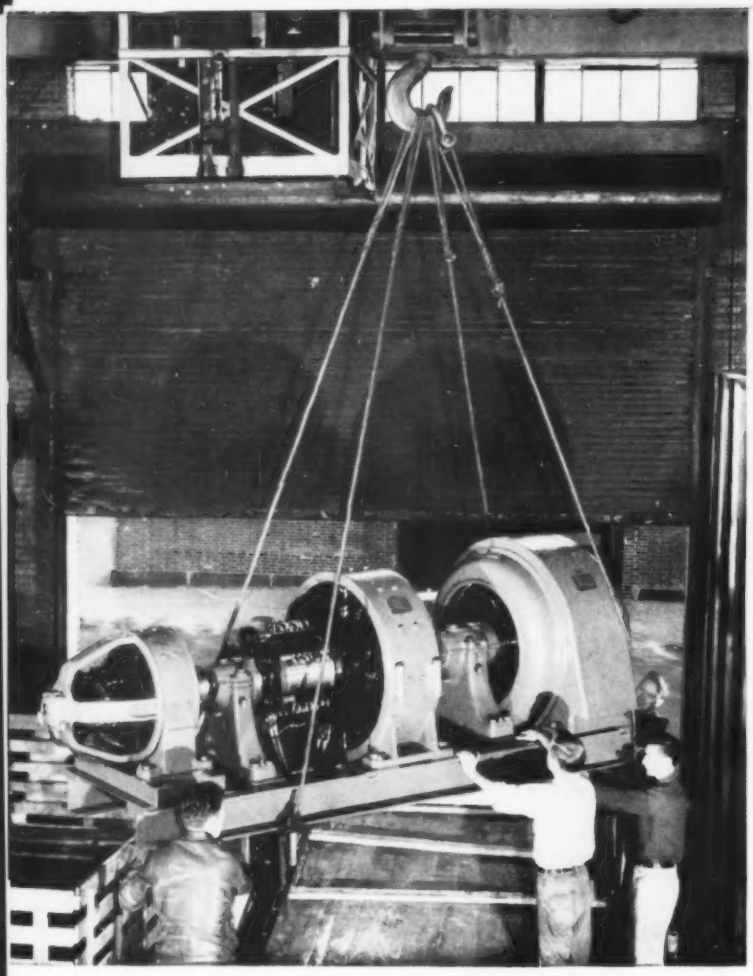
X Add disassembly, assembly and transportation time to actual repair time.

* Add repair cost, on straight time basis, of failed unit. This will be stocked for protection against future breakdown.

IN THIS PARTICULAR CASE HISTORY, the motor involved was a 500-hp slow-speed d-c motor on a machine critical to production at a large western paper mill. The problem was to determine how much an armature failure would cost. Downtime was estimated at $700 per hour. A G-E Maintenance Specialist helped the customer decide to stock a complete armature for best protection.

GENERAL ELECTRIC

TURN PAGE FOR STEP 5



PLANNED OVERHAUL, scheduled in advance, cuts outage time, reduces repair costs.

A CRITICAL MACHINE, like this motor-generator set, should have a rigid time schedule for servicing.

G.E.'s *Productive Maintenance* Plan

STEP 5 Establish a critical maintenance program

Minimize downtime costs two ways: by stocking critical parts, and by scheduling overhaul well ahead.

In Step 4, you determined the right degree of protection for each piece of critical equipment. Now take the action step—set up your critical maintenance program.

WHICH PARTS ARE MOST IMPORTANT? Get them *first*. Then organize your budget so that you can purchase the rest of your critical stock on a planned basis. Remember, too, that your critical equipment demands a more rigid schedule of inspection and service. Maintenance schedules must be more complete, and you must keep closer records of all operations, failures, maintenance and operating costs.

SCHEDULE PLANNED OVERHAUL of equipment inspected and listed in Step 4 on which probability of breakdown is high. Consider the difference in cost between planned overhaul and outage. Planned overhaul is effective after equipment has operated over a reasonable service life. You use it to remove from operation, on a systematic basis, the equipment that needs overhaul. You make this equipment available for inspection and complete rewinding, rebuilding, or modernizing at times most favorable to production. Result: the gap between actual and theoretical maximum production on the part of a machine is narrowed.

SCHEDULE PLANNED OVERHAUL WELL AHEAD, so all the necessary men, tools, and material for the work can be made available at the proper time both in your plant and in the repair shop. Overhaul can be set for normal downtime, vacation closing, holiday shutdowns, or for off-season production periods. Your objective should be to disturb production as little as possible.

PROBABLE RETIREMENT OR REPLACEMENT of every piece of critical equipment should be considered in this step. This means production requirements must be

ORGANIZE YOUR BUDGET to purchase the most important critical parts first.

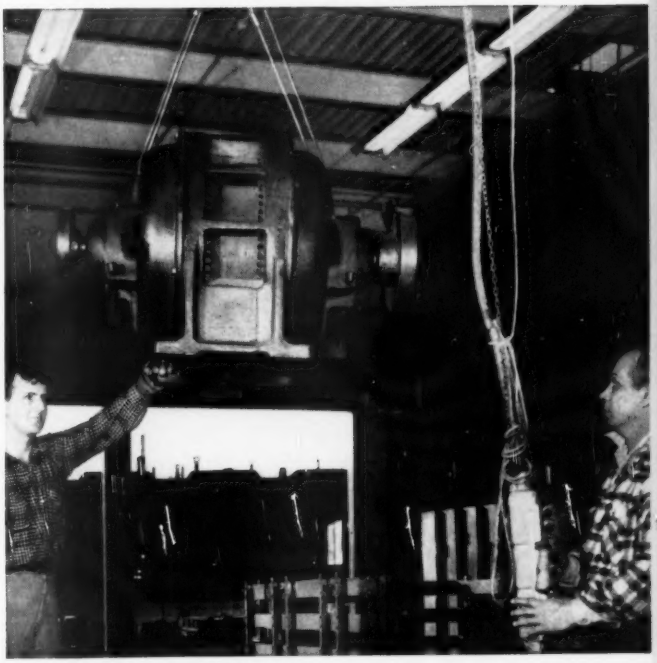
projected into future years. If the anticipated usage of the equipment is only for a short period, it may be economical to assume the risk of operating over that period without planned overhaul, and depend entirely on inspection and routine maintenance.

HOW ABOUT AN OVERHAUL "PACKAGE"? There will be cases where you can schedule overhaul of dependent or secondary equipment at the same time as your major apparatus. In other words, for minimum downtime, overhaul should not be thought of by *machine,* but rather by *manufacturing operation.*

Setting up a Productive Maintenance program is a big job. None of the steps is simple. But by carrying them out, you will show a steady increase in the efficiency of your maintenance program. You will be able to prove that Productive Maintenance is one of the most important and productive functions in your plant's operation.

GENERAL ELECTRIC WILL HELP YOU SET UP YOUR PROGRAM

GENERAL ELECTRIC



THE PROBABLE RETIREMENT of a critical piece of equipment must be considered when setting up overhaul schedules.

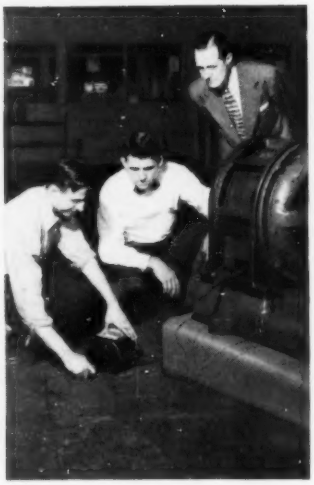
HERE'S HOW G.E. CAN HELP

How G.E. can help you set-up your *Productive Maintenance* Program

Your G-E Apparatus Service Shop representative is a Maintenance Specialist. He will work with you to simplify the job of setting up a *Productive* Maintenance Program in your plant. Call him in for help in the five areas listed below.

YOUR G-E MAINTENANCE SPECIALIST will supply complete parts data . . .

. . . guide you in planning routine inspection, routine maintenance and parts inventories . . .



. . . help you determine condition of all critical equipment and help schedule planned overhaul . . .

. . . help analyze critical equipment for best protection of each machine.

1—SUPPLYING COMPLETE PARTS DATA. Ask your G-E Maintenance Specialist to supply you with the identification of the various renewal parts in each piece of electrical equipment. Your basic records won't be complete without this information.

2—PLANNING ROUTINE INSPECTION AND MAINTENANCE. He can help you organize inspection trips and routine maintenance work by looking over your system, estimating how often equipment will need attention, and offering guidance on the best means of upkeep.

3—ESTABLISHING ROUTINE RENEWAL PARTS INVENTORY. Your G-E Maintenance Specialist can tailor a renewal parts program for your plant and guide you in establishing your parts inventory system.

4—ANALYZING CRITICAL EQUIPMENT FOR BEST PROTECTION. Ask your G-E Specialist to tell you just how long critical equipment repairs will take and how much each job will cost. He'll be glad to help you determine the best protection for each piece of vital equipment.

5—DETERMINING CONDITION OF CRITICAL EQUIPMENT. Your G-E Maintenance Specialist can help you assess the condition of all critical electrical equipment. And he can schedule men and machines at the G-E Service Shop to help you during planned overhauls.

FOR DETAILED INFORMATION:

General Electric Company
Apparatus Sales Division, Section A801-14
Schenectady 5, New York

- ☐ Please send me the detailed manual (GEA-6087) on setting up a Productive Maintenance Program in my plant.
- ☐ Please have a Maintenance Specialist from my nearest G-E Service Shop call on me.

NAME .....

POSITION .....

COMPANY .....

CITY ..... STATE .....

Productive Maintenance —as vital as production itself!

GENERAL ELECTRIC

WE'LL PROVE OSPHO STOPS RUST

Let's talk straight from the shoulder. In the first place, OSPHO is NOT a paint . . . it is a metal primer. Technically speaking—a carefully balanced formula of Orthophosphoric and Dichromate with extenders and wetting agents. *OSPHO is applied directly over rust* and when thoroughly dry, paint. *Will it stop rust?* YES!!!

Here's how you can prove it. SEND FOR YOUR FREE TRIAL SAMPLE OF OSPHO. Select a heavily rusted surface. Brush off loose rust and scale (no sandblasting or flame-cleaning necessary), then brush or spray OSPHO. When thoroughly dry, scrape the surface with a knife and you'll find OSPHO so tightly adhered to the rust that it is like scraping rough glass, a perfect base for paint. A chemical change has taken place. Iron oxide (rust) has turned to iron phosphate, an inert, hard, dark grey substance. OSPHO has stopped the rust action and primed the metal for paint. Remember, with OSPHO you don't have to remove the rust, paint jobs last two to three times longer, and you save on preparation time, on paint, and the cost of application. Repeat orders are constantly being received. There's nothing like satisfied customers.

OSPHO is supplied in gallon bottles @ $3.00, 10-gallon kegs @ $2.80 and 50-gallon barrels @ $2.60 F. O. B. Cleveland, Ohio.

Don't remove the rust—apply OSPHO. OSPHO forms a perfect bond between rusted metal and new paint. *Rust action has stopped!*

Use the coupon for a free trial supply.

A few choice territories open—distributors' inquiries invited.

Please send a Free trial supply of OSPHO

NAME_____

TITLE_____

Attach to your business letterhead and mail to:

RUSTICIDE PRODUCTS CO.
3127 PERKINS AVENUE · CLEVELAND 14, OHIO

←——For more facts circle 556 on Reply Card

For more facts circle 557 on Reply Card

Rubbish Disposal is only ONE of the Cost Cutting jobs for the Dempster-Dumpster in your plant...

It's amazing, almost to the point of fantasy, yet so soundly real, what the minds of men in all types of industry have cooked up for more efficiency and reduced costs with the Dempster-Dumpster.

Hundreds of plants are handling materials of practically every description with one truck-mounted Dempster-Dumpster serving scores of detachable containers. Here are just a few. Oils, gases, and liquids handled in our Tank Type Containers . . . tools and equipment in our Tool Shed Type Container . . . containers on casters placed for receiving steel chips from lathes or at conveyors for receiving finished products . . . container with doors and windows, replacing shacks for plant guards or nightwatchmen . . . containers built to handle chlorinator ash residue of approximately 1500° F. and there are dozens more.

Containers are placed wherever material accumulates. When loaded each is picked-up, hauled and emptied (as illustrated above) . . . or load set down intact. The entire operation is handled by only one man, the driver, by hydraulic controls in cab.

The containers are built in capacities up to 12 cu. yds. and each is designed to suit the materials to be handled—be they bulky, light or heavy . . . solids, liquids or dust.

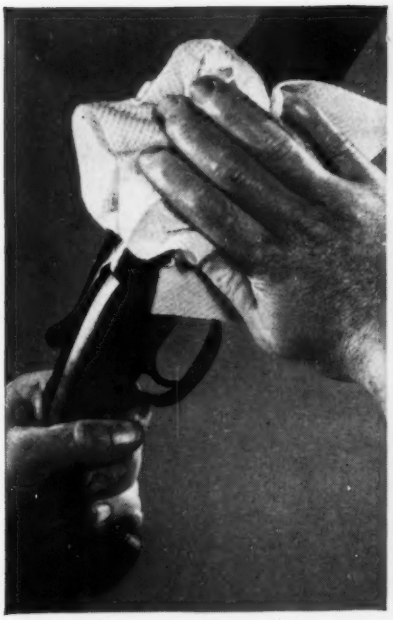
One Dempster-Dumpster, with driver, does the work of 3 to 5 conventional trucks . . . eliminates trucks and crews standing idle . . . eliminates rehandling of materials and increases efficiency and good plantkeeping.

If you have even any remote idea that this equipment could be adapted to your operation, by all means contact us because being without the Dempster-Dumpster System could easily be costing your company thousands of dollars annually. Manufactured and sold exclusively by Dempster Brothers, Inc.

One Dempster-Dumpster Handles All Containers . . . . All Sizes . . . . All Designs

DEMPSTER BROTHERS, 154 SHEA BLDG., KNOXVILLE 17, TENNESSEE

For more facts circle 558 on Reply Card



The Small Arms Industry requires a soft, absorbent wiper that can pick up metal chips and then be thrown away—so that carefully machined parts will not be scratched. Scott Wipers are the answer.

The Candy Industry, in particular, needs a clean, safe wiper. Scott Wipers are a natural for bakeries, dairies—any place where cleanliness is a must. Women employees, especially, like these wipers.

The Electrical Equipment Industry must have a versatile wiper. From dusting to cleaning-away heavy grease, Scott Industrial Wipers are equally adaptable for huge armatures or fragile condensers.

To meet a human need...

Scott Industrial Wipers bring a new standard of safety and efficiency to Industrial Wiping

The Hands of Production—your most important tools—are protected by disposable Scott Wipers. Harmful metal chips and filings are thrown away along with the used wiper.

Scott Industrial Wipers—
another Scott product that is
changing America's way of doing things.

Today, all over the country, more and more companies are changing to this entirely different wiping material, the Scott Industrial Wiper.

Scott Wipers now make wiping a scientific step in production—measurable in terms of cost, safety and efficiency.

Wherever you use wiping materials now, try Scott Industrial Wipers. See if they don't do a better job. And they're excellent for wiping hands and face.

Most firms have found an on-the-job pilot installation to be the best way of proving the merits of Scott Industrial Wipers. A Scott man stands ready to demonstrate this in your plant.

Simply mail this coupon or call your local Scott distributor.

SCOTT PAPER COMPANY
Dept. PE-F, Chester, Pa.

Please send me full information on
Scott Industrial Wipers

Name_____

Company_____

Address_____

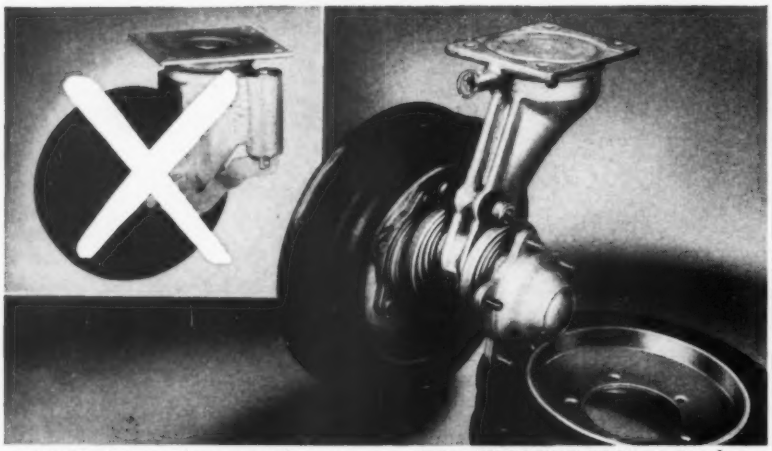
City_____ State_____

For more facts circle 559 on Reply Card

MATERIALS-HANDLING NEWS

★ Panel Discussions by Bassick, World's Largest Manufacturer of Casters and Floor Protection Equipment ★

Only caster made to absorb vertical and horizontal shocks



ROCKER-TYPE spring-mounted caster originated by Bassick — discarded in 1939.

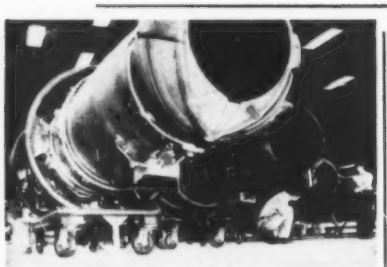
1954 "FLOATING-HUB" caster for 20-mph service, showing construction details.

15 years ago Bassick discarded "baby carriage bounce" system

You get *true* shock absorption in a Bassick "Floating-Hub" caster.

Unlike recently introduced spring-loaded, rocker-type casters, "Floating-Hub" casters absorb *both* horizontal and vertical shocks. Patented construction actually "floats" spring-controlled wheel in the frame, providing mechanical resiliency between rim and axle. Even over bumps and rough surfaces, all four wheels remain in contact with the floor — giving fragile and liquid cargoes a safe ride.

"Floating-Hub" casters have built-in snubbing action to give genuine shock absorption — an exclusive Bassick feature. They can't wobble, either, because wheel is kept rigid. Write for new Booklet FH-53, for facts on where and how to use Bassick "Floating-Hub" casters.



GE turbojet engines ride to inspection on "Floating-Hub" casters

You're looking at the business end of a big General Electric Company J-47-17 turbojet engine. It powers the U.S. Air Force's crack F-86D jet fighter plane to near-sonic speeds with help of afterburner. GE entrusts these jewel-like engines to Bassick "Floating-Hub" casters for safe handling.

Three new medium-duty "Floating-Hub" casters for 100- to 1000-lb. loads

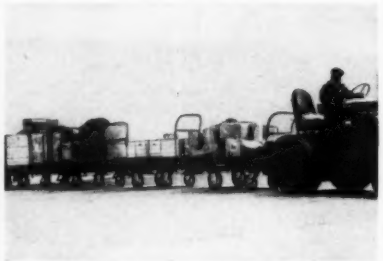
Series "FG" Airliner caster for high-speed service. "Floating-Hub" plus rubber "Floatread" wheels absorb shocks. 10" and 12" sizes.

Series "09" caster with "Floating-Hub" shock-absorbing action comes in 5½" and 7" dia. wheels. Rubber or semi-steel treads.

Series "S09" carries 560-lb. load with iron-core rubber tread wheel; 1000 lbs with 8" dia. semi-steel wheel. "Floating-Hub" action.

For more facts circle 560 on Reply Card

Not one caster failure in six years



These 12-truck warehouse trains at the Philadelphia Naval Aviation Supply Depot have been running on "Floating-Hub" casters since 1948.

In these 6 years not one caster has failed. That's typical of the service these casters deliver.

Complete load protection on every trip

Since 1948, "Floating-Hub" casters have prevented damage to N.A.S.D. cargoes. Accurate tracking through sharp turns is now provided.

Big savings

Prior to 1948, extra riders were required to replace fallen parcels. Today, only one man is needed — to drive. In addition, "Floating-Hub" casters do no harm to road and area surfaces — eliminating previous repair expenses.

Get the facts

Your Bassick industrial distributor has all the facts on the most complete line of shock-absorbing and conventional casters. He can give you valuable help in putting Bassick casters to work in your plant. You'll get fast service from him on all your requirements. Or write Bassick direct.

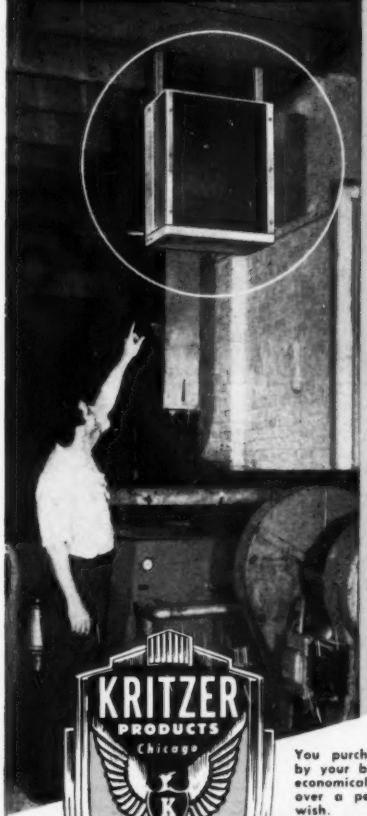
THE BASSICK COMPANY
Bridgeport 2, Conn.
In Canada:
Belleville, Ont.

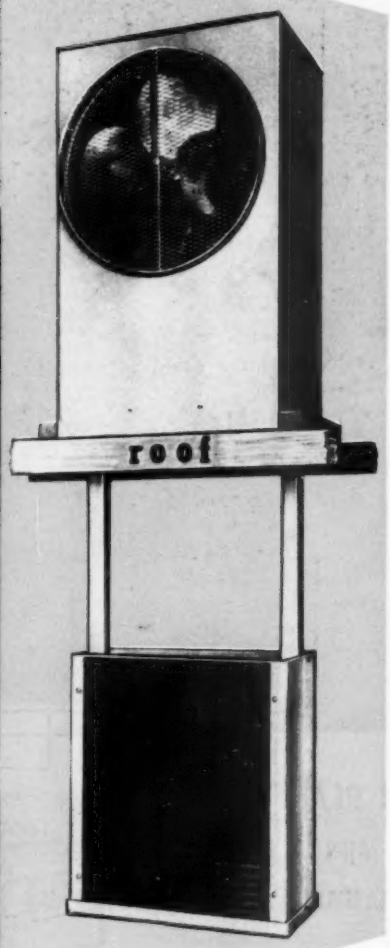
Bassick A DIVISION OF STEWART SW WARNER

MAKING MORE KINDS OF CASTERS . . . MAKING CASTERS DO MORE

75 YEARS OF CASTER LEADERSHIP

Now GET AIR CONDITIONING THE KRITZER WAY...





- *WHERE REQUIRED*
- *EFFECTIVELY*
- *CONTINUOUSLY*
- *DEPENDABLY*
- *ECONOMICALLY*

KRITZER now offers a new unitary, mechanized, self-contained, 2-ton refrigerating capacity roof unit. It makes a new and outstanding advance in flexible, low cost, easily installed, dependable air conditioning, using multiple units, placed in accordance with requirements.

40 years of experience in designing and manufacturing refrigerating and air conditioning units have gone into this flexible engineering achievement. Units can be centered in "hot spots", hot process areas, engineering departments, etc., cooling and cleaning the air through every unit. Dust and oil vapors are removed from the air at each unit. There are no water drains required for the condensate from the coils. Condensate water is elevated to roof unit and evaporated to outer air.

The KRITZER unit is ideally adapted for factories and various types of one-story structures. It is also applicable to the top floor of multiple-story buildings.

Your own maintenance crew can easily install the new KRITZER. There are no refrigerating connections to make. Installation is accomplished through a prepared opening on any type of roof and connecting unit to available electric power.

KRITZER units are sold ONLY FACTORY-TO-YOU. You purchase directly from the manufacturer. Send us blue print or sketch of your factory layout. Give the number of employees and heat processes if any. We will then recommend the number of KRITZER units required, and quote the price F. O. B. factory per unit. You will save the KRITZER way from one-half to one-third the cost of a "central" system!

PAY AS YOU GO

You purchase only the number determined by your budget. Begin air conditioning this economical way immediately — complete it over a period of months or years as you wish.

KRITZER PRODUCTS Chicago

KRITZER PRODUCTS

1232 W. LEMOYNE ST. • CHICAGO 22, ILLINOIS

For more facts circle 561 on Reply Card

MODERNIZING YOUR PLANT?

Get the work and storage space you need with standard HALLOWELL Unit Benches

Keep bench tops uncluttered, keep tools and parts at hand with these HALLOWELL benches. Spacious cabinets and drawers provide ample storage space, save many steps and much time. And HALLOWELL Unit Benches may be used individually or in continuous line anywhere in your plant. For complete information, consult your HALLOWELL distributor or write STANDARD PRESSED STEEL CO., Jenkintown 26, Pa.

1. Unit Benches 2. Stools & Chairs

HALLOWELL® SHOP EQUIPMENT DIVISION SPS JENKINTOWN PENNSYLVANIA

For more facts circle 562 on Reply Card

For more facts circle 563 on Reply Card →

AIR POWER

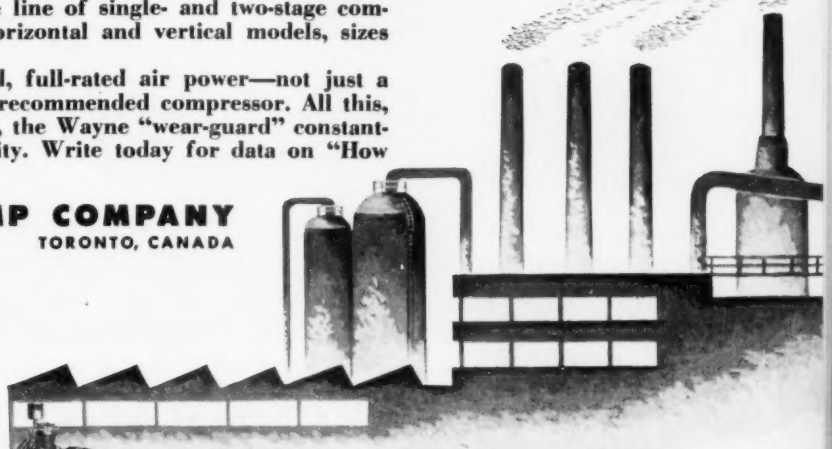
BUILT FOR YOUR NEEDS...

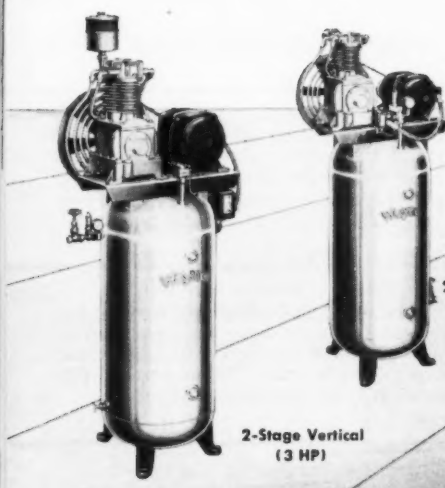
WAYNE *Job-Engineered* COMPRESSORS

NAME YOUR air requirements—we'll apply the Wayne Air Compressor to the job. Your air capacity, air pressure, horsepower and other requirements are related to one of the Wayne complete line of single- and two-stage compressors, high- and low-pressure types, horizontal and vertical models, sizes from fractional to 10 hp.

Wayne gives you pre-tested, guaranteed, full-rated air power—not just a theoretical displacement rating—for each recommended compressor. All this, plus longer-service automotive-type pistons, the Wayne "wear-guard" constant-level lubrication, and extra cooling capacity. Write today for data on "How to Select an Air Compressor."

THE WAYNE PUMP COMPANY
SALISBURY, MARYLAND TORONTO, CANADA



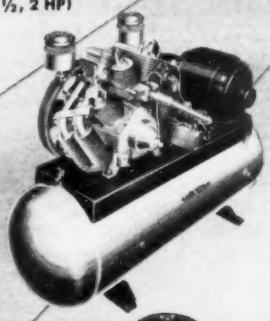


2-Stage Vertical
(3 HP)

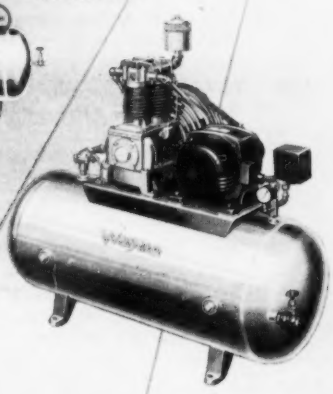
2-Stage Vertical
(1, 1½, 2 HP)

2-Stage Low-Pressure
(1½, 3 HP)

2-Stage Horizontal
(1, 1½, 2 HP)



2-Stage Horizontal
(7½, 10 HP)



2-Stage Low-Pressure
(1½, 3, 5 HP)

2-Stage Horizontal
(3, 5 HP)

2-Stage Horizontal
(7½, 10 HP without Tank)

Wayne
NATION WIDE SERVICE

LIFTS

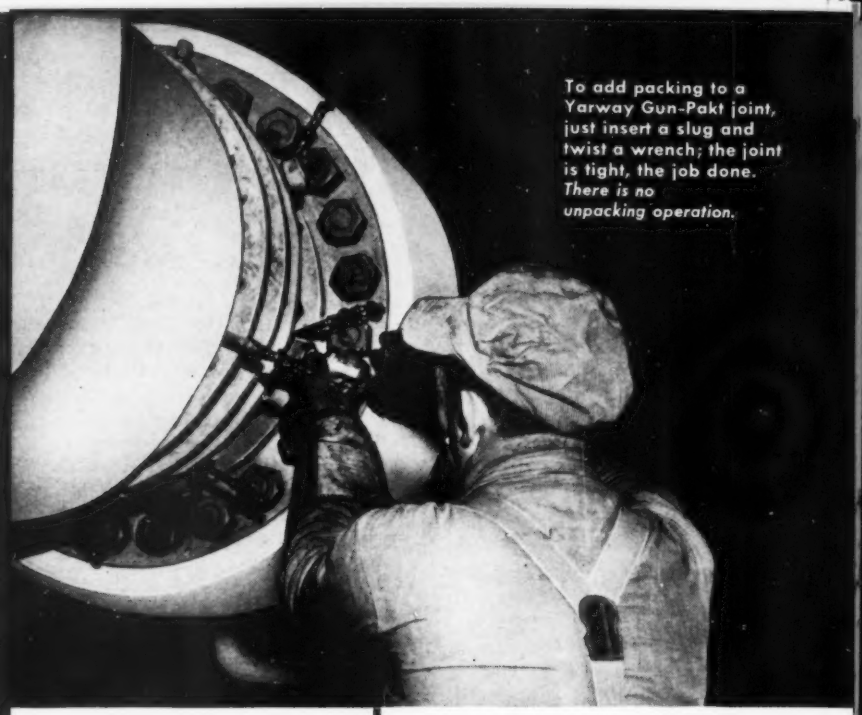
HOSE REELS

LUBRICANT DISPENSERS

INDUSTRIAL PUMPS

STARTLING NEW FACTS ON EXPANSION JOINT MAINTENANCE

It may cost less than you think to service expansion joints. Look at these records from three typical users of Yarway Gun-Pakt Expansion Joints:



To add packing to a Yarway Gun-Pakt joint, just insert a slug and twist a wrench; the joint is tight, the job done. *There is no unpacking operation.*

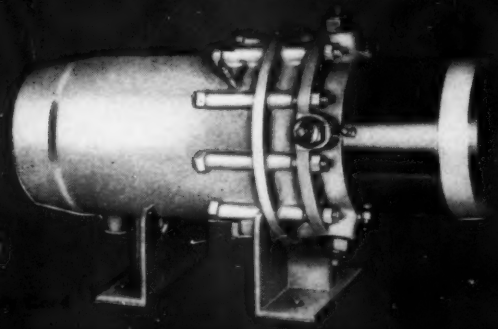
	YARWAY GUN-PAKT JOINTS	CONVENTIONAL GLAND-PACKED JOINTS
STATE UNIVERSITY*	Required addition of only 3 slugs (45 cents) of packing in 5 years. Lubrication only once every 6 months. Total labor time of only 2 manhours in 5 years.	Same lubrication as Gun-Pakt, *plus* gland tightening, *plus* complete overhaul with shutdown for unpacking and repacking every 3 to 4 years. Time for overhaul—25 manhours per joint!
MID-WEST AIRFIELD*	Only maintenance was lubrication and addition of 2 slugs (30 cents) of packing per year. Total labor ¼ manhour per joint per year.	Lubrication and gland tightening required 8 manhours per joint per year—plus complete unpacking and overhaul every 2 to 3 years. Time required for overhaul—20 manhours per joint.
"BIG TEN" UNIVERSITY*	Lubrication only once every 2 months, with packing added as needed. Total labor time charged, 1 manhour per joint per year.	General maintenance requires 6 manhours per joint per year. Complete overhaul required every 2 to 3 years with unpacking and repacking—24 manhours per joint.

*Names on request.

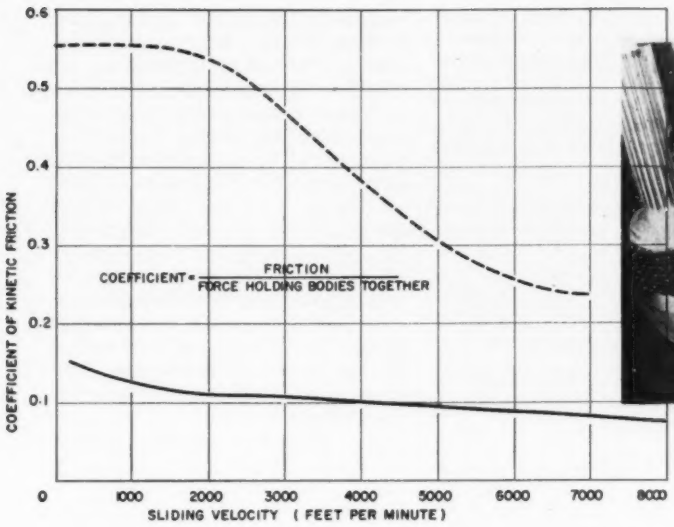
To get the full facts on Yarway Gun-Pakt Expansion Joints, and how they can save you maintenance money, write for Yarway Bulletin EJ-1913.

YARNALL-WARING COMPANY
145 Mermaid Ave., Philadelphia 18, Pa.

Yarway single-end, welding type Gun-Pakt joint for pressures to 300 psi, heavier design for higher pressures. Single-end traverses up to 12 inches; double-end up to 24 inches.



gun-pakt expansion joints



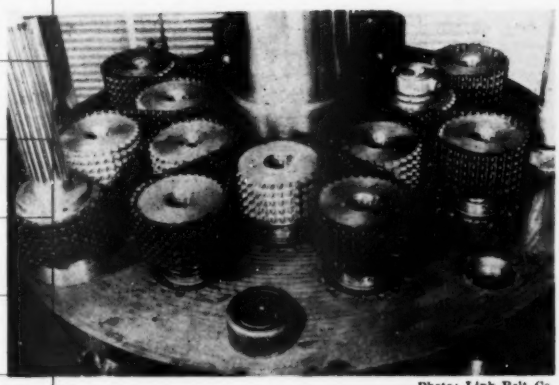


Photo: Link-Belt Co.

Fig. 1. Left: Effect of sliding velocity on coefficient of friction for dry steel and for steel coated with molybdenum disulphide. Above: Moly may be used on roller drive mechanisms

By EDWARD D. PADGETT

Is It True What They Say About "MOLY"?

Just what is molybdenum disulphide best suited for and where should it be used? . . . These questions are not answered here; we attempt only to give the background and a few of the indicated uses for this controversial lubricant . . . Also presented is a report by National Better Business Bureau on Moly as a motor oil additive . . . The editors invite pro or con letters from past users of Moly

AMONG SOLID LUBRICANTS that are creating interest are boron nitride and molybdenum disulphide. While relatively little is known about the former material at the present time, sufficient technical information is available about molybdenum disulphide to permit evaluation by plant engineering groups. The industrial sobriquet of the latter substance is Moly.

Moly is a dry lubricant. That is, it will lubricate when applied to metal surfaces as a dry powder. The particle size distribution of the refined material runs from about one to about seventy microns. It has a specific gravity of approximately five, is non-toxic, and has dielectric properties. The pure compound feels slippery to the touch, has a characteristic dark blue color, and leaves a tell-tale bluish gray streak on paper.

The effect of a sliding velocity on the coefficient of friction for steel coated with Moly is illustrated in Fig. 1. The effect for dry unlubricated steel is shown on the same drawing for the sake of comparison. A conventional definition of the coefficient of friction is indicated on the graph. Some readers may prefer to think of the coefficient in terms of the ratio of shearing stress and flow pressure, and the effect on friction caused by increasing or decreasing the numerator or denominator. Nevertheless, an important principle arises from coeffiecient concepts —namely that MoS_2 has the ability to "plate out" onto certain hot metals whenever a shearing force ruptures the conventional oil film.

Lubrication by MoS_2 is independent of any adsorbed films of moisture. Consequently, engineers now can consider lubricants with an additional degree of freedom for hermetically sealed, evacuated, or high temperature systems, since conventional materials used for such purposes tends to oxidize readily, or require water vapor films for lubrication.

Fabricated metal parts, such as load or thrust bearings, that have been cleaned properly can be coated with Moly by tumbling, brushing, dipping, or spraying. A thin coating of MoS_2 (a thickness of less than 0.0001 in.) is quite adequate for ordinary purposes. This dry lubricant may be brushed onto the sliding and moving parts of a semi-automatic weapon, for example; working the action several times by hand provides enough pressure to rub the powder onto the sliding and bushing surfaces where it will do the most good in reducing friction. MoS_2 will not gum or collect dust.

Variations in the above technique can be used to apply molybdenum to close fitting machined parts during assembly operations. For example, about 5 per cent of MoS_2 by weight in hot lubricating oil (150 to 160 F) may be used for assembling press-fitted pins into sidebars and bushings.

Since it has good film strength

Table I. Tests on sintered materials with and without Moly as releasing agent

Metallic Material	Coefficient of friction	
	Initial	After Contin. Sliding
Clean copper tubing	1.35	1.37
Sintered Copper	0.40	0.85
Sintered copper containing MoS_2	0.18	0.15
Sintered bronze	0.60	—
Sintered bronze containing MoS_2	0.28	—

Table II. This chart shows various uses of MoS_2 as an industrial lubricant

Name of Fluid Vehicle	Method of Applying MoS_2 and General Engineering Use	Observations
None	Brush or rub dry MoS_2 powder on machine tool gears, cams, and ways	Reduces maintenance and increases output per machine
None	Rub MoS_2 powder on dies used in cold forming and drawing operations	Reduces scoring and seizing; increases die life
None	1 to 10 per cent Moly by weight, mixed with metal powder prior to sintering.	Lubricity of MoS_2 is used to control frictional properties of sintered metal parts
None	Applied dry to moving parts of aircraft landing gear and hydraulic systems	Reduces scoring and galling; simplifies maintenance schedules
Volatile carriers (alcohol, acetone, benzene, carbon tetrachloride, ether, etc.)	7 per cent MoS_2 by weight mixed with the fluid; fluid carries Moly to remote chain drives, sprockets, or ball and socket joints	Carrier evaporates and leaves dry film of Moly for lubricating purposes. Do not operate machinery until carrier has evaporated; allow ventilation to remove vapors
Volatile carriers	2 to 10 per cent of powdered Moly added to carrier and used during assembly of heavy generator cores	Dielectric lubricants are required by electronic plants; fluid carries MoS_2 to region of difficulty
Corn syrup (dark)	One part MoS_2 by volume to one part hot syrup; applied to iron parts, flat steel springs, and pistons at 700 F; bake coated part (300 F to 500 F) until dry; cool, then rub off excess material	Special heat treatment of some fluids will yield tough, resinous, bonding films
Drawing compound (or oil of suitable viscosity)	One part Moly mixed with three parts drawing compound (or oil) for cold forming operations on steel parts	Reduces scoring and seizing; increases die life
Glycerine (or polyalkylene glycol)	½ pound MoS_2 in one gallon glycerine heated to 400 F; dip clean tool bits, taps, and drills into mixture and allow to come to bath temperature (degrease and clean parts in suitable solutions prior to above treatment)	Agitation due to heating may prevent MoS_2 from settling out; if not, provide sufficient agitation; use hood to carry away vapors; increased tool life
Grease (short fiber wheel bearing)	Containing an equal part of Moly and used for packing automobile wheel bearings	Reduces friction
Greases (or suitable soaps)	Mixed with 5 to 20 per cent Moly and used during assembly of threaded fittings on iron pipes, and bushings on valve stems	Might prevent seizing and galling or reduce disassembly time
Mineral oils	One part MoS_2 in two parts oil are used during hot pressing and forming operations: a. swabbed on hot dies when temp. is less than 700 F	Eliminates sticking
Silicone mixtures	b. sprayed on at temperatures from 700 F to 1000 F with about 10 to 20 per cent MoS_2 are used on detents and moving electromechanical parts of equipments	Reduces scoring, sticking and freezing of moving parts

molybdenum disulphide can be used on both metals and plastics—steel, aluminum, brass, methacrylates, nylons and others—to reduce friction, etc.

Certain complex lubrication problems have been solved by blending powdered Moly with various liquids. Some of these fluids serve as carriers, while others act as bonding resins. The use of a bonding agent is described in the applications chart. As an example of using a fluid to carry the Moly to a region that requires lubrication consider the following—a mixture of equal parts of MoS_2 and SAE 30 motor oil was painted on a generator shaft, operating at high temperature, to prevent parts seizure.

It was concluded after an exhaustive series of tests, that if Moly is added to suitable liquids, the resulting blends can be valuable as boundary lubricants for metals and plastics. Yet, there is no general rule of thumb for determining the amount of MoS_2 to be added to a given fluid.

Because of technical demands for more power, higher heat rejection, and rigorous military specifications, many plant engineers have become interested in high temperature lubrication problems. It has been tentatively established that MoS_2 is an effective lubricant, when heated in air, up to temperatures as high as 700 F. At about 750 F the substance begins to oxidize. Above this latter temperature the oxidation rate increases steadily and prevents lubrication at temperatures above 1050 F.

On the other hand, if a neutral atmosphere (argon or xenon) can be used, molybdenum disulphide can withstand temperatures greater than 2300 F without decomposition. Moly will not decompose in an evacuated chamber at 1950 F.

Designers contemplating the use of MoS_2 lubricants at high temperatures must satisfy themselves that they have provided adequate stabilization and protection from oxidation if the temperatures encountered are greater than 650 F for prolonged periods of time. Otherwise, molybdenum disulphide lubricants should not be used.

Cognizant engineering laboratories have made suggestions that have resulted in solutions for several high temperature-acute oxidation problems. In one application, MoS_2 and a stabilizer have been mixed with various glycols, silicone fluids, or syrups, and applied to turbine, bellows, and afterburner components of jet engines. When a 1.5 Mach Number jet plane is operating, the temperature of some of the metal parts approach 750 F. Although the fluid is lost during the process, it enables sufficient Moly to become bonded to the moving, or ex-

panding parts, to provide lubrication.[1]

Moly retains its lubricity down to temperatures of about —40 F. A few specialized low temperature ball bearing problems have been solved by blending MoS_2 with resinous materials, and curing after application to obtain lubrication at —55 F. It is emphasized that these are isolated instances, and this procedure is not satisfactory for use at temperature near —55 F.

Films of MoS_2 maintain their lubricity under conditions of high pressure and strong shearing forces.

Molybdenum disulphide is used as a mold releasing compound in ceramics plants and in the production of sintered metal parts. In the latter application, about 1 per cent to 10 per cent of MoS_2 by weight is mixed with the powdered metal prior to pressing and sintering operations. For the purpose of illustrating this activity, some tests on sintered materials are summarized in Table I.

Notice, in Table I, that friction increases for sintered copper, while for sintered copper containing Moly the coefficient decreases after continuous sliding; this is due to the lubricity of the impregnated MoS_2.

Research laboratories are reporting interesting economies that can result from the use of molybdenum disulphide lubricants.

---

[1]See "The 'Moly' Motor Oil Additives" published herewith.

What the NBBB* Says About Moly As a Motor Oil Additive

Molybdenum disulphide is recognized as an effective lubricant under many conditions of use, including use in automobile and airplane parts. NBBB has been unable to secure competent and recognized test data either confirming or challenging claims for this lubricant when used as a motor oil additive.

IN RECENT MONTHS, numerous molybdenum disulphide (MoS_2) motor oil additives, many containing the word "Moly" somewhere in their trade names, have been widely advertised as products which will improve the efficiency of motor oil many times over, as well as increase gasoline mileage. Typical claims for such products have been: "The new 'Miracle Lubricant'—until now used only in United States Air Force jet fighter planes." . . . "Makes your oil 383 per cent more efficient" . . . "a whole winter of faster starts" . . . "Reduced gas and oil consumption."

Questions have been raised with NBBB concerning the validity of performance claims for these products. NBBB has written to each known advertiser of such Moly products, asking for verification, by test data from recognized scientific sources, of the claims made for their additives. In addition, contact has been made with a number of automotive, airplane and oil companies, scientific laboratories, and trade and professional associations in the automotive and lubrication fields.

Testimony of Advertisers

Those advertisers of Moly products which have replied to NBBB have based their claims for their motor oil additives on the following points:

1. All of the advertisers emphasize the fact that they have testimonials from satisfied users. Some refer to many months of heavy sales, resulting in expressions of consumer satisfaction and no reported complaints.

2. Reference is made to published material of such authorities as the National Bureau of Standards and the National Advisory Committee for Aeronautics, citing the superiority of molybdenum disulphide as an agent in diminishing friction.

3. The widespread use of molybdenum disulphide by prominent industrial and governmental organizations, including its alleged use by the Air Force, in atomic energy plants, and hundreds of nationally known companies, is cited.

4. As to tests on their own products, the advertisers refer to tests made by the manufacturers of such products. One advertiser refers to a test made by a local automobile dealer, and another refers to a test (known as the "fixed throttle" test) made by an automotive magazine.

Several of the advertisers emphasized the fact that their product was radically different from each of its competitors, differing in quantity and micronization, and suspension of molybdenum disulphide present as well as containing vastly different additional ingredients . . . with consequent differences in performance qualities. To the extent that this is true, it therefore follows that a claim proved to be accurate for one Moly product would not necessarily be true of another product.

Outside Sources

Many of the authorities contacted by NBBB stated that they had no data as to the effectiveness, or lack of it, of any Moly product as a motor oil additive. The National Bureau of Standards stated that they had never made a test on any Moly product as a motor additive and their widely quoted test paper on this substance was confined to its use under static conditions (i.e., not under conditions of use in a jet or reciprocating engine).

Business firms cited in advertising as users of MoS_2 confirmed their use of molybdenum disulphide in various lubricating jobs (including usage as a lubricant in automobile or airplane parts) but such firms informed NBBB that they had not used MoS_2 as a motor oil additive in any reciprocating or jet engine. Several advertisers of MoS_2 have advised NBBB that numerous large firms have purchased their product for automotive use.

Since prominent reference had been made, by some Moly advertisers, to use of their product by the Air Force or in jet engines, NBBB queried the U. S. Air Force and we have the following telegram from the Commanding General of Wright Development Center (Wright Field, Dayton, Ohio):

"The Air Force has several applications for molybdenum disulphide dispersed in an oil or grease. This center has not authorized use of molybdenum disulphide as an additive to jet engine and reciprocating engine lubricating oils. There is no existing Air Force engine specification permitting use of molybdenum disulphide as a lubricant."

It is to be noted that although the Air Force confirms that it has several applications for MoS_2 as an additive to oil or grease, it has not authorized the use of this chemical as an additive to jet engine and reciprocating engine motor oils, and it should be so stated or implied in the advertising of these products.

Some Rebuttals

Reference has been made to a favorable report on molybdenum disulphide, prepared under the auspices of the National Advisory Committee for Aeronautics. This paper (Technical Note No. 1578), speaks favorably of many fine performances of this ingredient and adds:

"The possible use of molybdenum disulphide as an addition agent in fluid lubricants should be questioned in accordance with the line of reasoning that has prevented the complete acceptance of various forms of graphite for such an application. Molybdenum disulphide is insoluble in common fluid lubricants; consequently, it is probable that the compound would deposit in undesirable accumulations throughout a lubrication system."

When this statement was referred back to Moly product advertisers, they stated that, while the rest of the article deals with the factual superiority of Moly, this fragment represents only the opinion of the authors, and is itself not substantiated and, in fact, refuted by the experience of users.

When asked by NBBB for test data from independent sources, some advertisers of Moly products claimed there are no test procedures on motor oil additives that, if followed, would meet with universal acceptance from the lubricating and automotive industries. To devise a procedure that would meet with unanimous acceptance, and follow it out, would, they state, cost approximately forty thousand dollars. A noted laboratory informed NBBB that it would test a specific Moly product for $2500 and the manufacturer thereof expressed a willingness to authorize such tests—if the test specifications were satisfactory to him. When the specifications were submitted, the manufacturer found various faults with them and declined to proceed.

Meanwhile, NBBB has learned that at least four tests are now in progress, two of them being made on behalf of Moly additive advertisers. It is possible that

(Continued on page 208)

*National Better Business Bureau, Inc.

TVI* ELIMINATION
Good Neighbor Policy Enforced by FCC

***Television interference is a problem faced by many plants in fringe areas today . . . Here's a story of the difficulties faced and overcome by one company through the use of electrolytically-deposited copper on paper backing**

By **HENRY E. VOEGELI**, Development Engineer, The American Brass Co.

TELEVISION interference emanating from equipment in your plant, may, if it arouses sufficient attention from the Federal Communications Commission, be quite a man-sized headache. Such an eventuality confronted the U. S. Fiber & Plastics Corporation, Stirling, New Jersey. Seven years ago this company began to make the well known "Million-Air" Play Plastics and Sports Plastics, consisting of plastic balls, rings, mats, wading pools, swimming pools and other things of kindred nature for pleasure on the beach and on the lawn.

The operators of the plant availed themselves of the most modern and scientific equipment including dielectric welding machines for heat sealing or welding the seams in their various consumer and military items made from vinyl plastic sheet material. Their business progressed peacefully for two years and then fate dealt a wicked blow.

Quite suddenly there appeared a new great product of science—television. It was soon discovered that these welding machines were emitting high frequency electric impulses that were interfering with television reception. Unfortunately the plant is located on the fringe of the normal range of New York City television transmitters, about 40 miles away, so that a relatively minor signal from industrial equipment can easily be stronger than the television signal from the transmitter at the end of its range.

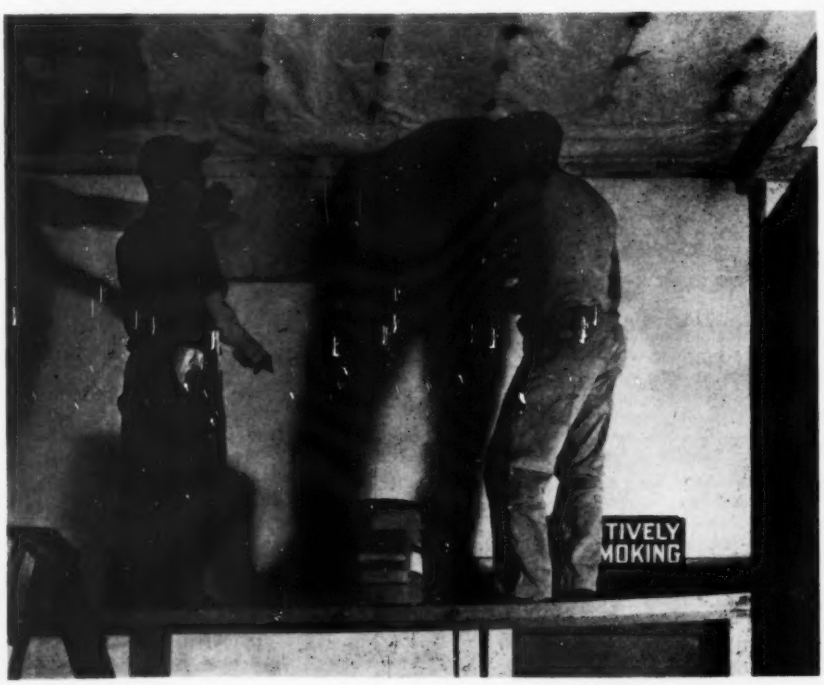
The inevitable followed, complaints were received, and tests were made which showed that the interference extended as much as a mile from the plant. Television reception was blotted out entirely at frequent intervals in the homes nearby every time a machine went into action. Good public relations were put in jeopardy and the impending danger of punitive action by the Federal Communications Commission was a constant threat particularly if the company was interfering with essential services — Police, Army and Aviation.

Management had been informed that five years grace had been allowed by the FCC and that it would expire about one year hence on June 30, 1953. It had been expected that the equipment manufacturers would design suitable machines and rework those in use, but no solution at all came from this source. Sympathy came from all sides, but since there was no related precedent to follow nor any experience with such a problem, the position of this manufacturer became quite clear. There was a choice of three things: to find a remedy, to move to a far-away location where there was still no television, or to go out of business. This was a "do or die" situation and a challenge to that noble stuff called ingenuity and resourcefulness which has made American industry great.

The lot fell to Edwin T. Kaiser, engineer and Vice President of the company to find a way of satisfactorily shielding or otherwise correcting the interference that was in violation of FCC regulations. The presumed logical refuge would have been to tune the errant equipment to the radio frequency bands that are set aside by the FCC for the industry using this type of machine, to wit 13.56, 27.12 and 40.68 megacycles. At first glance this would seem to be fair enough but actually there is an unavoidable sweep over a wide range of frequencies in each operation of the machine. The range is estimated to have a spread of about 4 megacycles.

Then there is the possibility of sending interference waves in the 2nd or 3rd harmonic of the frequency at which the machine is operating. Several attempts have been made by both equipment manufacturers and by plastic fabricators to design or tune each individual machine as to make it "ra-

Electrolytically deposited copper sheet, on paper backing, is here being applied to inside surface of exterior walls with an adhesive and a clinch lock joint



diation free," but all such attempts have proved to be impractical. There is also the chance that when the mechanic adjusts the machine for perfect operation its frequency of oscillation may be far afield from the band that has been allotted. The complexity of the problem is multiplied when many such machines, from a tiny oscillator to a mighty giant as powerful as a broadcast station, are located in one department.

With an abundance of first hand experience it was easy for Mr. Kaiser to realize that the only sure way of mastering the problem permanently was to shield the entire dielectric heat sealing department, if it were practicable. Being an engineer he was aware that copper is the best material for shielding of this kind. His investigation turned in the direction of the producers of copper where he soon learned of the paper thin copper "Electro-Sheet" that is marketed by The American Brass Company, also that American Brass Engineers were somewhat acquainted with the principle of electrostatic shielding with copper sheet. Shielding of entire rooms had already been done with this product, either plain or paper backed, but mostly in laboratories.

The first was Steinmetz Hall of the General Electric Company exhibit building, New York World's Fair where 10 million volt man-made lightning was shielded with 2 ounce copper (2 ounces per square foot). Next came the High Tension Laboratory, National Bureau of Standards. This was done with two ounce paper-backed copper bonded to the masonry walls.

Also among the first was the studio transmitter room of the Don Lee Broadcasting Company, Los Angeles, California. Other important installations of shielding with this material were made by Westinghouse in Baltimore and Pittsburgh, by Chance-Vought in Stratford, Connecticut.

The U. S. Fiber and Plastics Corporation was dealing with frequencies that are higher than those of the past and harder to control. Ultra high frequency can best be controlled or attenuated by a solid copper sheet or with two or more isolations of copper separated by air spaces and without metallic contact, except for occasional grounding at the doors and wherever one might have reason to touch the walls. The thinner the copper sheet the better (within practical limits) because attenuation and reflection are improved with a reduction in thickness.

Copper screen cloth has been commonly used for shielding with frequencies below a million cycles and has a proper place with the higher frequencies if used intelligently and wisely.

In possession of this information Mr. Kaiser set out to eliminate or at least to reduce the electromagnetic radiation to the level prescribed by the FCC, namely, that the radio frequency energy shall not exceed 10 microvolts per meter at a distance of one mile from the equipment and in addition, shall not cause interference with any television set (and there were several within 500 ft of the plant) or any other licensed service, such as Police or Aviation Communications.

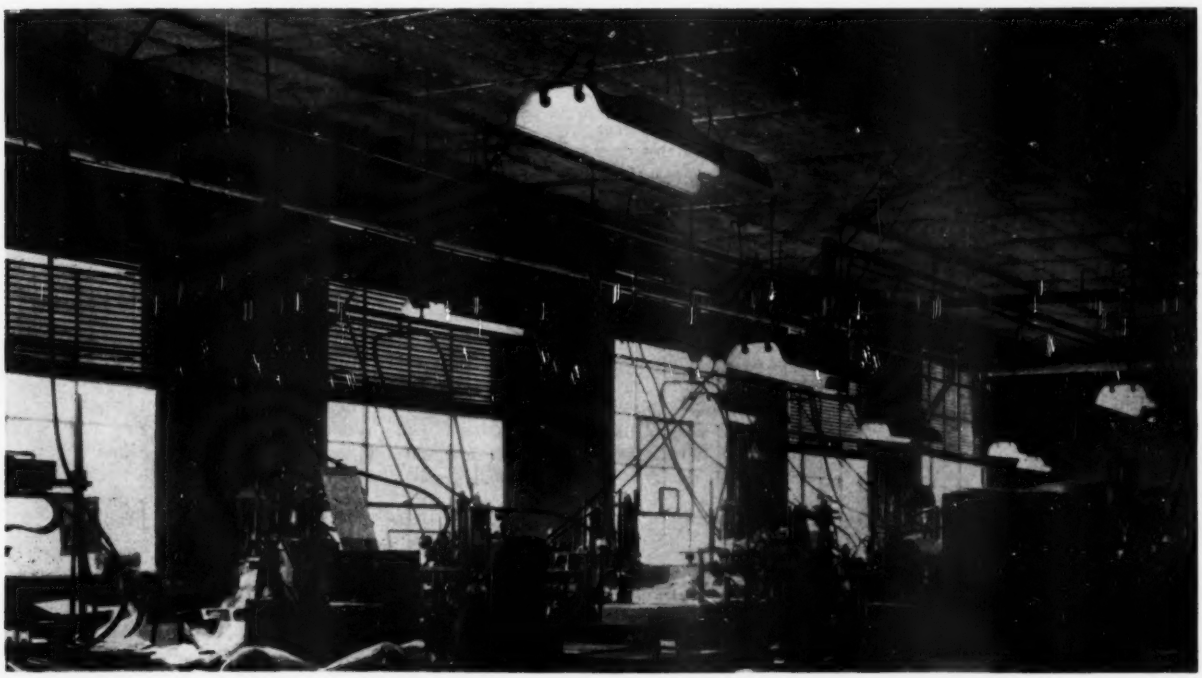
To do this at mimimum cost without wasting money and at the same time to be positively sure of success was the goal. At best this expenditure could only be regarded as a total loss, or the price for remaining in business.

As a first try, which fortunately proved successful, the walls and ceilings of the entire dielectric sealing department were covered with two ounce copper, the large windows were filled in, except the ventilating sash which were double screened, as were the exhaust ventilators through the roof.

Floors are shielded with bronze screen cloth of a special mesh and gage of wire, the power cables entering the area are filtered and all pipe lines have isolating sections of rubber hose as they pass through the walls of the shielded enclosure. These arrangements were designed to accomplish the desired result with a mimimum of inconvenience or additional cost to the production and assembly operations of the plant.

The final tests were made by a firm of professional consulting engineers who found that there is no more interference with even the closest neighbors, and have so reported to the Federal Communications Commission.

This is how the ceiling of the dielectric sealing department at U. S. Fiber & Plastics Corp. looked after shielding it with paper-thin copper applied to the underside of insulating board. Floors are shielded with bronze screen cloth



Hiram Walker's Plant Guards Prevent Accidents "In-the-Making"

In addition to standing orders governing their regular duties, the plant guards also check a daily report listing possible sources of accidents

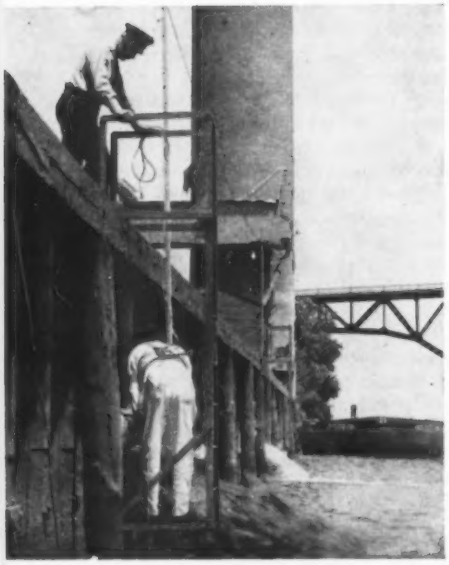


Fig. 1. With lifeline in hand, guard watches over laboratory technician taking sample of sewer water from river

Fig. 2. When welding near flammable material, guard stands by with chemical extinguisher or a small water hose

THERE'S A LOT more to being a plant guard than meets the eye. Presenting a good appearance, of course, is one of the requisites of the occupation but there are other requirements even more important, such as enforcement of company regulations, appreciation of the importance of the job and constant availability in event of an emergency.

But exacting as these duties may seem they are so only because of the objective of the safety and plant protection department: the protection of the plant personnel from the consequences of accident and fire, and the conservation of the company's assets.

Daily Report

Morale of the safety and plant protection crew is a vital consideration in the type of results obtained. Hiram Walker & Sons, Inc., Peoria, Illinois, world's largest beverage distillery, has found that one way of attaining morale is to see that the men know what to do and how to go about doing it.

In addition to a set of standing orders governing their regular duties, the guards are also required to fill out a daily report which lists possible sources of accidents as well as suggestions for good housekeeping. A brief outline of the items they have to check is listed below:

1. Smoking violations. Employees are prohibited from smoking inside or outside of buildings on company premises, except in office areas, the cafeteria, and the rest rooms.

2. Blocked or inoperative fire doors or exits.

3. Shut sprinkler valves or blocked sprinkler heads. Care must be taken to observe that sprinkler heads are not blocked by stacked cases or boxes.

4. Below normal temperatures inside of rack warehouse which would hurt product aging.

5. Employee infraction of plant rules.

a. Identification badges must be worn at all times.

b. Passes for all packages leaving premises must be signed by department head.

c. Departure from company premises in Hiram Walker smocks or coveralls is prohibited.

d. Use of intoxicants while on duty or company premises is not allowed.

6. Parking violations, such as parking in restricted areas or driveways.

7. Security of all doors and windows.

8. Security of gates, fences and railroad cars.

9. Unusual sewer conditions, like overflow or odor.

10. Unsightly conditions such as broken windows, markings on buildings, rubbish accumulations, unreadable signs, grass which needs cutting.

12. Barges at the dock should be firmly secured. Docking and departure time of all barges should be noted.

13. Accident hazards such as obstructions in production room aisles, loose railings, banisters, guard rails, and slippery floor spots or stairways, overhead impediments.

14. Fire hazards during welding work. Follow these instructions:

a. Before welding or flamework is started, Plant Production Department much check all areas where an open flame would be dangerous, as in or near places containing flammable vapors or liquids (alcohol), and dusts (grain or feed), or any loose combustible material. The checking is done with a vapor meter.

Guards Stand By

b. Wet burlap must be placed on all tank openings, also on and around any valves where there may be an alcohol seepage.

c. Exposed combustible material which cannot be moved, must be covered with fire resistant tarpaulins, so placed to catch all sparks or hot metal.

d. Where it is necessary to do welding or cutting close to wooden structures or where combustible materials cannot be moved, plant guard is required to stand by with chemical extinguisher or small water hose. The guard remains at the scene for at least 30 minutes after completion of work to be sure that smoldering fires have not started. He rechecks again after 3 hours and again after 6 hours.

Fig. 1. Thirty plant engineers representing fourteen companies in Houston, Pasadena, Texas City, Freeport and Sweeney

Texans Start Club in Houston

In true Texas style Plant Engineers of the Houston Area meet to form the South's first Plant Engineers' Club . . . Thirty engineers — some from as far away as Freeport — attend

HOUSTON, the capital of Texas for four years in those heroic days when Texas was an independent republic, is the center of the newest, and the South's first, Plant Engineers' Club. Plant engineers of the Houston Area met for the first time on March 15 as a result of a letter and invitation originated by Gerald Austin of the Gulf Atlantic Warehouse Co. of Houston.

In the course of the meeting a temporary organization was set up and he was unanimously elected chairman. During the course of the meeting he appointed the committee shown in the small group photograph at right.

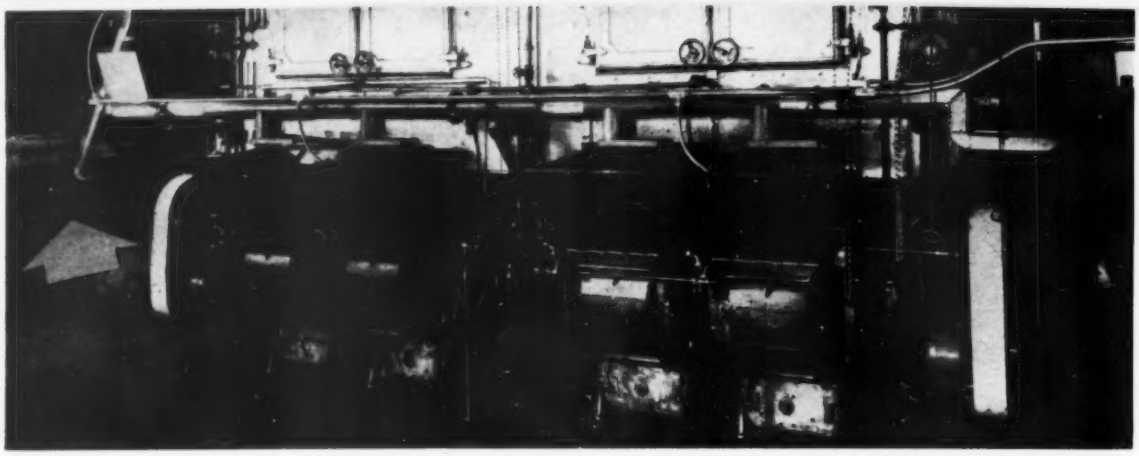
Those attending the first meeting represented 14 companies from five communities and interest in the club movement was as widespread as Lufkin and Beaumont. Because of the tremendous industrial development of the Texas Gulf Area and the distances involved there was some discussion of the possibility of eventually having several local and closely related groups with possibly one or two joint meetings a year.

Individuals attending the first meeting were: J. Aho, Rheem Mfg. Co., Houston; J. H. Anderson, Reed Roller Bit Co., Houston; G. W. Austin, Gulf Atlantic Warehouse Co., Houston; Greig Beeler, Gulf Atlantic Warehouse Co., Houston; Ames Bliss, Cameron Iron Works, Inc., Houston; R. W. Callahan, Monsanto Chemical Co., Texas City; L. C. Dishman, Carbide & Carbon Chemicals Co., Texas City; W. G. Eargh, Phillips Petroleum Co., Sweeney; E. Hanak, Lubrizol Corp., Pasadena; R. E. Harmond, Phillips Petroleum Co., Sweeney.

M. B. Hill, Mosher Steel Co., Houston; H. C. Hix, Manchester Terminal Corp., Houston; S. S. King, Dow Chemical Co., Freeport; W. A. Langdon, Mission Mfg. Co., Houston; Lee O. Legler, Gulf Atlantic Warehouse Co., Houston; Martin Meitzen, Cameron Iron Works, Inc., Houston; C. L. Mills, Lubrizol Corp., Houston; R. H. Morris, PLANT ENGINEERING, Chicago; E. H. Pace, Emsco Mfg., Houston; H. E. Padgett, Carbide & Carbon Chemicals Co., Texas City; Robert Phillips, Phillips Petroleum Co., Sweeney.

M. C. Raney, Dow Chemical Co., Freeport; A. J. Romeril, Monsanto Chem. Co., Texas City; W. E. Seales, F. H. Maloney Co., Houston; R. A. Shave, Mission Mfg. Co., Houston; F. J. Sisson, F. H. Maloney Co., Houston; L. E. Stockton, Emsco Mfg. Co., Houston; J. H. VanderWeide, Carbide & Carbon Chemicals Co., Texas City; Frank Vickrey, PLANT ENGINEERING, Houston; N. F. Wood, Monsanto Chemical Co., Texas City; and A. Young, Mission Mfg. Co., Houston.

Fig. 2. Gerald Austin (seated, second from the left) was elected Chairman of the meeting and appointed a committee to develop meetings, organization and membership programs to present at the second meeting. Committee members, seated, left to right, are Messrs. Callahan, Austin, Seales, Phillips and Aho. Standing, left to right, are: VanderWeide, Hix, Anderson, Pace, Raney, Bliss



First conveyor (arrow) brings coal from bin, far left, dumps it into hopper of second, which carries coal to hoppers

Coal Handling Costs Cut 68 per cent

Two comparatively small boilers, burning 4000 tons of coal per year, burned, in addition, $1.00 per ton just in handling costs . . . Screw-type conveyor equipment for filling stoker hoppers cut cost down to 32 cents per ton

By S. A. SIMONSON, Plant Engineer, The Chicago Hardware Fdry. Co.

DURING THE SIX months of our firing season automatic stoker feeder equipment saved us $2,720.00 in coal-handling costs! Besides this dollars-and-cents advantage it has given us a number of other welcome benefits: a complete solution to the problem of costly absenteeism and labor turnover in our boiler room crew; a boiler room that the firemen are happy to work in and keep clean; and greatly simplified boiler operation and maintenance.

The Chicago Hardware Foundry Company, of North Chicago, Illinois, covers 18 acres of land has a building floor area of 40,000 square feet. In this one plant we perform eight major manufacturing operations: manufacture of grey iron and non-ferrous castings, porcelain enameling (wet and dry processes), heat treating, polishing, machining, painting and plating. Among the products we manufacture are metal furniture for restaurants, soda fountains, counters and bars, electric wash-room dryers, and many items under contract with other companies.

Our power-house equipment consists of two 150 hp HRT boilers with spreader type stokers and one 100 hp water tube boiler with an underfeed stoker, operating at 80 psi. This equipment furnishes heat for about 65 per cent of the plant buildings as well as process steam for plating, drying, and water-heating. We burn approximately 4,000 tons of coal per year, averaging 20 tons daily in winter.

Until recently we used hand labor to keep our stoker hoppers filled. In order to facilitate this work, it was necessary to construct a platform across the fronts of the boilers. A long wooden ramp ran from this platform to the coal pile outside. Coal-wheelers would load the coal on wheelbarrows at the pile, wheel it up the ramp, and dump it directly into the stoker hoppers. Two men were required for this job, one on a 7:00 am to 3:00 pm shift and the other on an 11:00 pm to 7:00 am shift, working seven days a week during our 6-month firing season.

The transition to automatic coal-handling was quite simple. We tore down the inconvenient platform across the boiler fronts and the ramp to the outside coal pile. We then installed two specially-designed screw-type conveyors manufactured by Hager Brothers, Inc., Rockford, Illinois.

One of these conveyors carries the coal from a new bin adjacent to the boiler room to the second conveyor, which runs horizontally across the fronts of the boilers with a discharge spout at each stoker hopper. When the stoker hoppers are full both conveyors are automatically shut off. If desired, spouts to individual stoker hoppers can be shut off manually for operation of a single boiler.

In comparing our present coal-handling cost with that of our former method of hand operation, we find that our automatic equipment will pay for itself in one and one-half firing seasons—nine months of actual operation. Our labor cost of handling the coal by hand was $4,000.00 per firing season. Actual figures of the cost of operation of our stoker feeder equipment are as follows:

Power cost, ton of coal handled	10c
Cost, crane labor	16c
Estimated maintenance cost, ton	6c
Total cost, ton of coal	32c

With a consumption of 4,000 tons of coal, the cost of one six-month firing season's stoker feeding with our present system is $1,280.00. Our automatic feeder thus saves us a total of $2,720.00 per season. The total cost of this equipment was $3,850.00.

We have been particularly well pleased with the stoker feeder because of a number of design features which cut maintenance costs and down-time. Both conveyors feature a unique "floating screw," driven at one end through a universal joint. The unit requires no intermediate bearings to interfere with the advancing coal and require lubrication. The coal itself supports the screw throughout its entire length.

We have no worries about prolonged down-time and expensive servicing caused by tramp metal, foreign bodies, or chunks of coal too large to pass through the conveyor. A "tramp metal slot" allows the conveyor to carry such materials to a position in the tube where it can readily be removed by the operator. In the event of shear pin breakage, all components in the assembly are maintained in their proper operating relationships, and it is simply necessary to replace the shear pin.

All elements of these conveyors are simple in construction, ruggedly built and sturdy in operation. From our experience, we feel that it will give us trouble-free service for a long time.

Here, Coal Unloading Costs Get Fast Shakedown, Too

Two men, working eight hours each, formerly were required to unload one hopper-bottom car at this plant . . . Now, it is done by one man in from four to ten minutes . . . In addition, the accident potential has been eliminated

INDICATIVE OF THE substantial savings in unloading hopper-bottom cars presently obtainable through the utilization of mechanical methods for handling this operation, is the experience of The Parker Appliance Company, Cleveland, Ohio.

Last summer this company, searching for a low-cost way to simplify and speed up unloading of incoming coal cars, installed a car shaker manufactured by the National Conveyor and Supply Company, of Chicago. Since then, hopper-car unloading costs have received a "fast shakedown" at this plant.

Installed in Parker Appliance's receiving yard on a powerhouse rail spur, this car shaker is motor-operated, driven by a 5-hp, 1750-rpm, a-c motor built by the Reliance Electric & Engineering Company, of Cleveland. The unit is mounted on a jib crane, which has an upright column with a 9-ft. swinging boom, 1-ton high speed chain hoist, and 1-ton ball bearing trolley. The installation is located adjacent to an underground two-ton hopper between the rails of the track.

To unload a coal car, the shaker is swung with the jib crane into position on the car and clamped to its sides by a steel bar. One end of the bar is hooked onto the underframe of the hopper car; the other fastened on with a heavy, adjustable-tension screw on the shaker. Turning the adjusting nut on this screw pulls the shaker tight against the car side.

Time required to unload a car depends primarily upon the speed at which the emptied contents can be removed into storage or at point of use. In conveyorized installations, the speed of the conveyors determines the speed of unloading because the shaker is capable of keeping the material-handling equipment operating at full capacity. In those instances where the material is dropped into a large pit or from a trestle, coal cars have been unloaded in from four to 10 minutes!

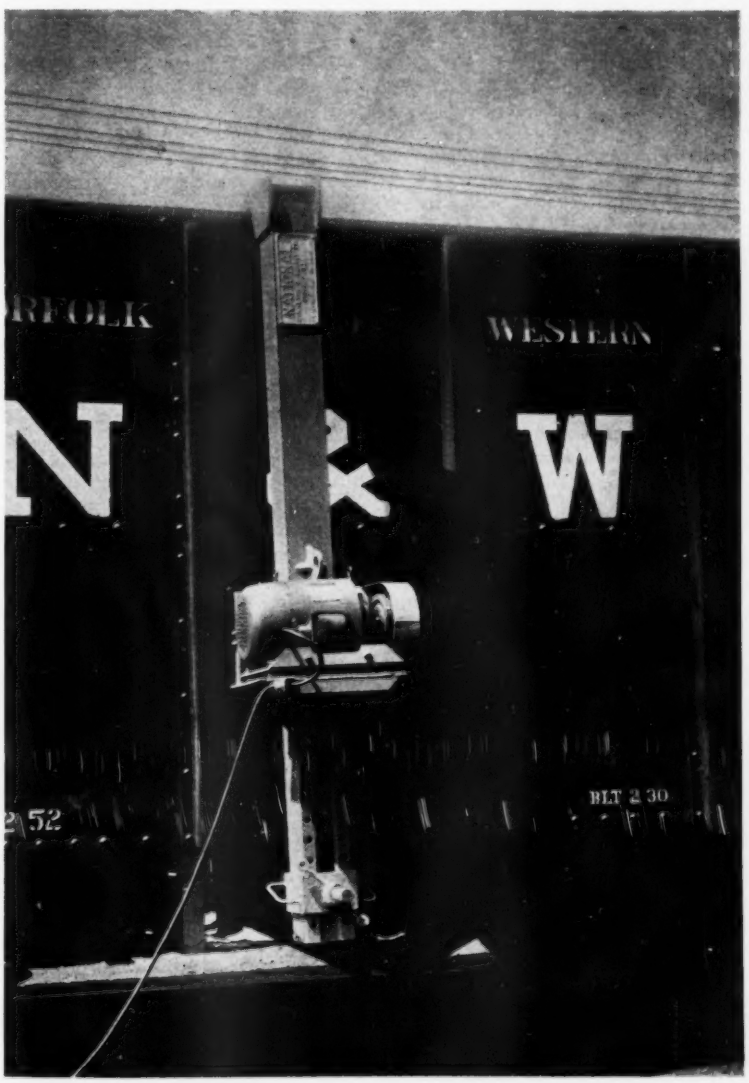
At the Parker Appliance plant, the limited capacity (two tons) of the track hopper restricts the operation of the motor-powered shaker to an intermittent basis. Even so, a loaded coal car usually is emptied by one man in approximately ⅜ the former time.

Formerly, two men were required to unload a car—the job took eight hours, often more. The operation was also somewhat hazardous.

Now, with a mechanical shaker operated by one man—thereby releasing the second operator for other work about the powerhouse—this job is done with a time-saving of 62½ per cent per car. To put it another way, the time formerly required to unload a car was 266 per cent of what it now takes!

Accident potential which previously prevailed has been completely eliminated. No one is needed inside the car and only one man is required to set and operate the shaker. Thus, one man completes the entire operation.

Push-button control car unloading at Parker Appliance plant in Cleveland saves 62½ per cent in time over manual methods which were previously employed



DESIGN and what it does to help MAINTENANCE

Design—of plant, department, area, or production machinery—can be a big factor in correct maintenance of equipment . . . Wrong materials, crowding, unsafe conditions, inadequate drawings, specifications, instructions militate against good maintenance, in author's opinion

By **PAUL LINDHOLM**, Professional Engineer

IN INDUSTRY TODAY engineering and maintenance are inextricably tied together. The trend is such that there can be no division of these groups if maximum continuity of operation is to be achieved at minimum cost to management. A new field of specialization in the form of maintenance engineering and administration is almost here.

Effective maintenance begins in the Engineering Department. No equipment can be "maintained" into high efficiency; its design is responsible for its economical operation. It has been shown many times that excessive maintenance costs can be blamed on poor engineering. Such examples as poor design or application of a machine and its components, impractical equipment space layouts, instability of installation and inaccessibility are not conducive to good maintenance.

Don't Discourage Maintenance

One of the quickest ways to discourage proper maintenance is to crowd equipment into space so tight that maintenance men can hardly maneuver themselves into position to get at the unit. Again, evidence of poor engineering is shown in the necessity for removing component parts to adjust or replace a defective part. With a little foresight and rearrangement many such conditions need not exist.

Still another item is the misapplication of materials and equipment: bearings that don't last because thrust load was overlooked; motors that keep burning out because of improper torque characteristics; circuit breakers that open frequently because they are misapplied for circuit conditions; materials that fracture because of shock load that was not considered; lubrication that fails because it is of improper type. This list could be extended to cover every facet of design, but is sufficient to illustrate the importance of good engineering for good maintenance.

There is an axiom which says "in all things be moderate." This is particularly true in engineering. The spreading out of equipment and its components for easier maintenance must, of course, be balanced against the cost of added space. Between these extremes lies the optimum selection. It would be poor engineering to go to either extreme. As a matter of fact good engineering is a matter of happy compromise between cost and the goal to be accomplished.

All this does not mean that good engineering is a panacea for all maintenance ills. Maintenance must share its full load of responsibility as every piece of industrial equipment requires some maintenance during its lifetime. The engineers' function in this respect is to minimize maintenance.

How far to go with engineering and maintenance is a matter of economic balances. The philosophy of "good enough is best" applies in almost every instance. A case in point would be the needless expenditure for a totally enclosed motor for an operation where an open type would be perfectly satisfactory. On the other hand, the most expensive exhaust duct material may be the most economical selection for a corrosive atmosphere ventilating installation.

There should be no compromise with safety. However, there is one issue to be made regarding engineering for safety and that is, don't overdo it to the point of absurdity. This does not mean that we should compromise with safety. It does mean that too many appendages may defeat the original intent to make the job really safe. Each additional safety device beyond that which is reasonable, adds to maintenance and makes questionable the reliability of the safety installation.

Adequate Specifications

The engineer should capitalize on maintenance experience when an original installation of machinery and equipment is being planned. It is not sufficient to consider the engineering complete when the design meets the engineer's satisfaction and an order has been written for its construction or installation. Every maintenance problem: erosion, corrosion, wear, depreciation, accessibility, stability and safety, should be considered. In order that these problems be given their due consideration sufficient time should be allotted in the engineer's work schedule.

It should be standard procedure that adequate drawings, specifications and instructions be provided for installation and future maintenance reference. It should be emphasized that accuracy in drawings is of paramount importance if their greatest value in cutting maintenance costs is to be realized. A drawing is most useful in an emergency. The time it takes to trouble-shoot, particularly on complicated wir-

ing circuits, can be greatly reduced by adequate and up to date drawings. Too often in the rush to get a project into production and to start another, the drawings are not brought into line with field changes.

Experience has shown that unless this is done immediately it never will be done because of the tendency to get on the incoming jobs as soon as the current project is working. This will cost management additional maintenance labor hours. The answer is obvious: allow sufficient engineering time to finish the job.

"Standardization of equipment for greater interchangeability and consequent reduction of spare parts will contribute considerably to reduced maintenance costs"

Departmental statistical performance records are sometimes responsible for an incongruity. This has to do with the success of one department in saving money. This saving looks good on the record, but it may result in the loss of even greater sums in another department. To be specific, the time and money saved by hasty and inadequate engineering may be lost many times over in maintenance labor hours.

Standardization of equipment for greater interchangeability and consequent reduction of spare parts inventory will contribute considerably to reduced maintenance cost. Standardization of installation looks more dramatic when entered on construction specs. However, it does help in maintenance, since it provides more consistent installations making for easier maintenance through familiarity.

Just as maintenance depends upon good engineering, so engineering depends upon good maintenance. It has been said that "the best engineered job will be no better than its maintenance." In other words, unless qualified craftsmen are available—the best engineered plans may fail. In the past, qualified craftsmen were obtained by a process of elimination. That is, the foreman was as selective as possible when he hired men. He then fired those who did not measure up to his expectations. The help reservoir never seemed to run dry.

Labor Relationship

Today this system no longer works as well as it did before. Not only are we drawing off the bottom of the reservoir but the relationship between men and management has changed too. Contact is now made through intermediary groups of employee representatives of organized labor unions or independent associations. So important has this relationship become that many companies require the full time services of experts in the field of labor relations and these are top management positions. The day of maintenance supervisor running his job to suit his fancy is past. With job evaluation grades, labor contracts, grievance committees, etc., the present day maintenance engineer not only has to know the technical aspects but also must be familiar with and appreciate the intricacies of labor relations.

"Barstin! Your brains are showing."

It has become increasingly difficult to hire good mechanics, men who are enthusiastic and proud of their craft. In order to provide for sufficient skilled craftsmen to meet the needs of industry some companies have established their own apprentice training schools; the apprentice being selected on a competitive basis and having certain qualifications making for a good craftsman.

Maintenance has long been considered a necessary evil. With increased technological advances and attending complications of automatic equipment, with higher production per unit, it has become more evident that good maintenance is a most important factor in insuring low cost and continuity of production. A continuous flow of product with a minimum of down time, will result in a decrease in manufacturing cost. With the higher cost of replacements and labor, and with a scarcity of strategic materials good maintenance plays a more important role than ever before.

The transition from simple maintenance to complex maintenance is beginning to tell. It wasn't so long ago that the ordinary house-wiring type of electrician could adequately handle all the electrical work in most plants. Today this is no longer so. Electro-hydraulics, electro-mechanics, servo-mechanisms and electronic welder and motor controls are too complex for the average electrician. A technician is now necessary.

"When we arrive at the pushbutton stage of automation maintenance workers may no longer be classified accountingwise as 'indirect' but as 'direct' productive workers since operators may be maintenance mechanics"

With the increased use of synthetics and new materials, refinements of the older materials, changing methods of controls, lighting, lubrication, communication, it is becoming increasingly difficult to properly choose materials

(Continued on page 198)

Tell-Tale Instrument Checks Poor Driving, Bad Floors

Here's a comparatively simple instrument that has possibilities for greatly reducing high maintenance costs on industrial trucks . . . Test results show causes and cures

By WILLARD S. MIELZINER, President, The Impact-O-Graph Corp.

USE OF IMPACT MEASURING devices on in-transit loads has been proven an economical and accurate means for measuring, and recording on tape, the severity of impacts, shocks, jars and vibrations, the time they occurred, plus the direction from which they originated. In addition, such instruments also detect, graphically, when a shipment is standing still as opposed to when it is in motion, together with any over-all changes in the position of the load.

While such applications have been firmly established and their economies and other benefits recognized, the use of impact measuring devices on industrial trucks to record day-to-day operation of such vehicles, is not widely known. Even so, some companies have already shown that undue maintenance costs of industrial trucks have not been caused altogether by faulty manufacture or construction, but rather by careless driving, by poor flooring, inattention to careful operation over rough terrain, etc.

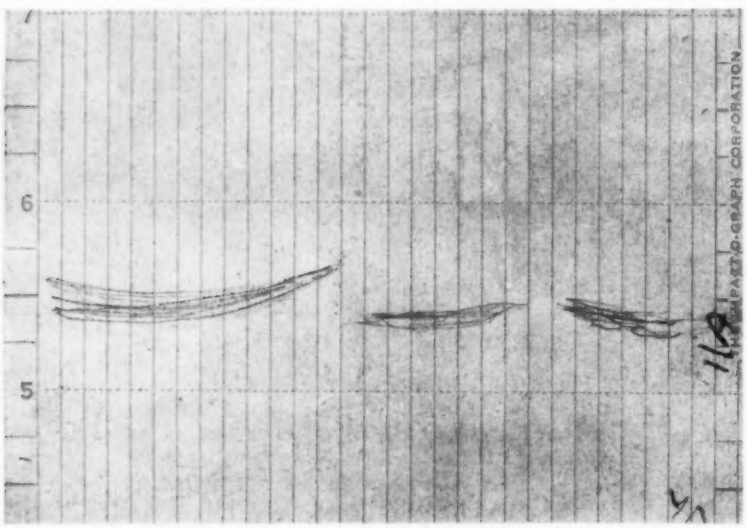
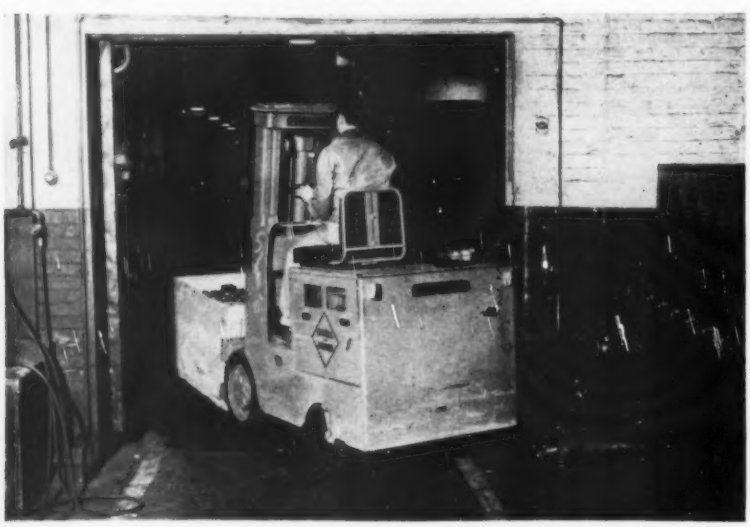


Fig. 1A. This graph shows what happens when the driver banks off a wall in order to make a turn at high speed. Readirg shows a shock in excess of 9 G's

Fig. 1B. This is how a driver might look when bouncing off the side of a doorway. This photo was taken in tests conducted by manufacturer of electrical trucks



Here is a typical example of how impact measuring instruments unearthed hidden causes of rapid and repeated truck breakdown.

Some months ago, our engineers were invited to visit a steel mill whose personnel were concerned about the excessive damage to axles, frames, and other parts of a particular make of industrial truck which it was using.

The problem: trucks were out of service a disproportionate amount of time; costly repairs were necessary; certain minor production stoppages occurred; over-all handling efficiency suffered.

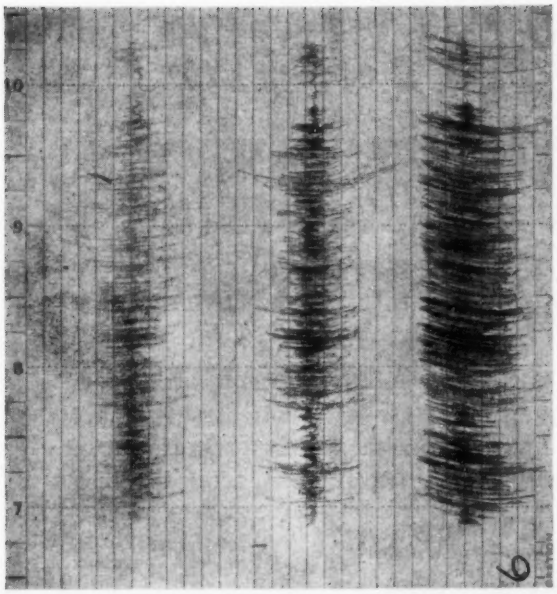
To ascertain the causes for truck breakdowns, our impact measuring device, the Impact-O-Graph, was equipped with a high-speed motor to better pinpoint time of occurrence of rough handling, and attached to the truck's battery compartment. The vehicle was then put into normal service.

This simple test uncovered the following. (1) The truck operator, in making turns, frequently used the building walls as an aid in banking. (2) Stops and starts were sudden and severe, especially the former. (3) Even over rough floors, the truck was operated at excessive speeds. (4) Railroad tracks were frequently crossed, again at unduly high speeds.

In total, improper operation was proven to be the chief cause of rapid truck breakdown, high maintenance costs, etc.

Recorders were accordingly mounted on other trucks used by this company. Tapes taken from these instruments are now checked against a "normal operation tape" made by the plant

(Continued on page 206)



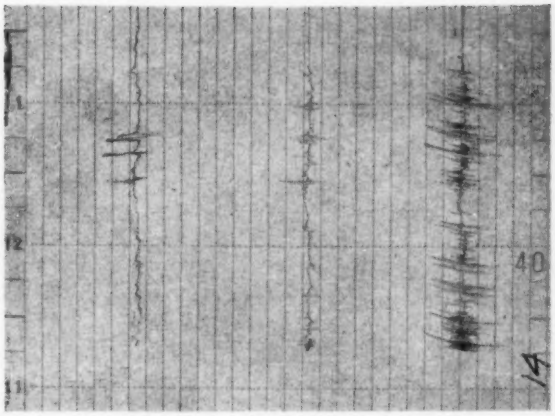
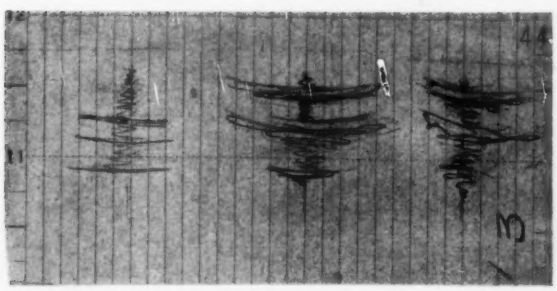
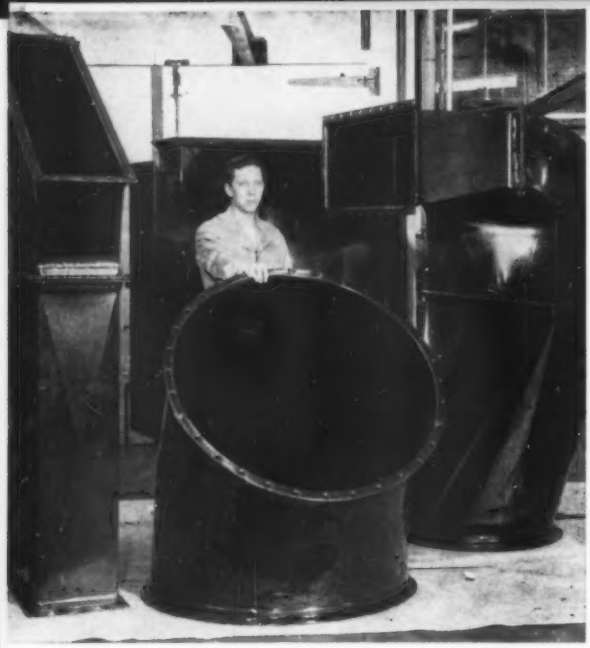


Fig. 2A and 2B, Left and Above: Result of travel over rough pavement. Graph at right was with poor tires at high speed; one above was with good tires at moderate speed. Fig 2C, Below: Rough and rutted alley where tests were conducted

Fig. 3A, Below: Travel over a 2 by 4 placed in an aisle—as shown in Fig. 3B, Right—produces graph like this. There are three styli in the instrument and they record the shocks as follows: 1. The left-hand series of marks indicates side motions or shocks; 2. The middle marks indicate front and back motion; 3. Marks at right indicate up and down motion





Plastic Film Protects Metal From Corrosion

Metals exposed to corrosive fumes are getting a new lease on life with this baked-on plastic which forms a tough, abrasion-resistant, non-porous coating

Fig. 1. A non-porous coating of plastic has been applied to the duct sections of a fume exhaust system to withstand wear, abrasion and corrosive fumes

SERVICE LIFE of industrial processing equipment exposed to corrosive fumes is being extended with the help of a plastic film which is baked on the equipment, giving it a tough, corrosive-resistant coating.

According to the manufacturer, this plastic, Quelcor, is extending the service life as well as cutting the maintenance cost on such equipment as tanks, heavy castings, fume exhaust stacks, flanged pipe sections, blowers and other accessories that come in contact with corrosive chemicals.

This plastic combines the properties of polyvinyl chloride with application possibilities of dip coating and offers a coating designed for maximum chemical resistance. The viscous dispersion of the plastic is heat-fused on metal surfaces to form a tough, abrasion-resistant, non-porous coating from 1/32 to 3/16 in. thick in a single dip.

The material flows into every undercut and crevice, forming a continuous casing entirely free of seams, joints, or other points of possible chemical attack. This results in a film that has the deterioration-proof properties of polyvinyl chloride and in addition is supported on a metal structure which is mechanically sound. Expansion and contraction are restricted by the metal backbone.

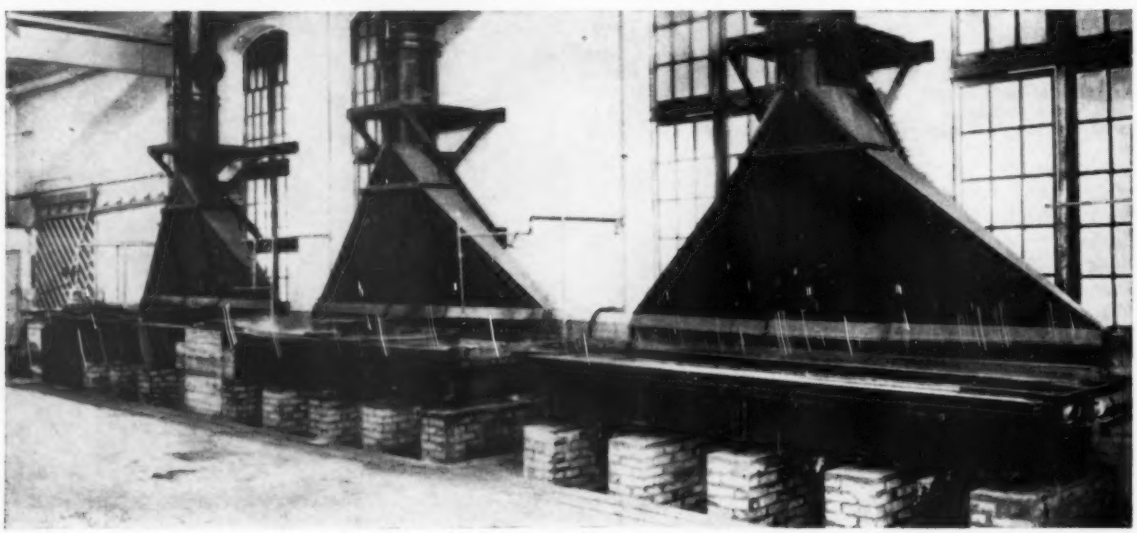
Figure 1 shows the duct sections of a fume exhaust system which have been given a non-porous surface to withstand wear and abrasion as well as entrained sulphuric acid, hydrogen sulphide and carbon disulphide fumes.

This protective coating is also recommended by the manufacturer for steel grating, wire mesh screening, bolts, nuts, clamps, plating racks, dipping baskets, and other industrial equipment exposed to industrial acids.

Additional Information

If you would like to receive more information about this product, either write The Editor, Plant Engineering, 110 South Dearborn St., Chicago 3, Illinois, or indicate "Quelcor" on the bottom of postage-paid cards in issue.

Fig. 2. Hoods and ducts coated with this protective film have been installed in the Trenton, New Jersey, plant of John A. Roebling's Sons Corp., for handling hot muriatic and sulphuric fumes. Coating is also recommended for steel grating, wire mesh screening and other industrial equipment which is exposed to corrosive fumes or possible abrasion



New Drives Handle Big Production Increase

In addition to an almost doubled output, this plant was able to save on work of six employees and to cut its previous power bill practically in half

THE MORGAN ENGRAVING Company of Dallas, Texas, has, by modernizing the drives for its machinery, been able to handle an increase of 180 per cent in business and at the same time to save the labor of six employees and cut its power bill almost in half. This was not done all at once but started with the conversion of one drive, which showed such good results that a progressive program was decided upon and carried out over a period of two years. It is an interesting story and suggestive of many possibilities which doubtless exist in other plants both large and small.

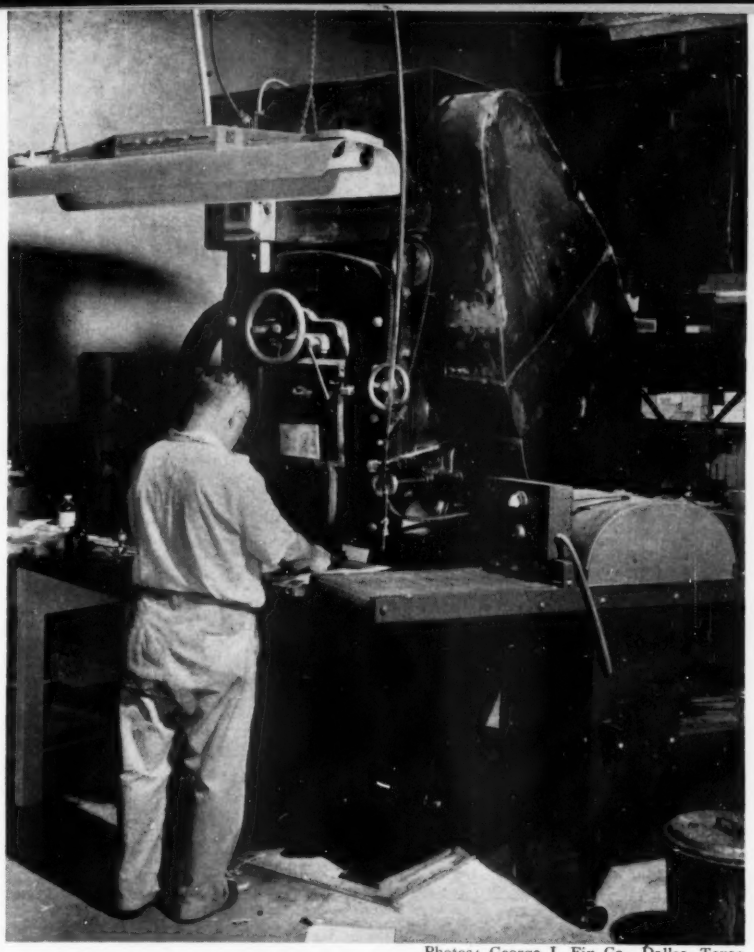
After comparing their operations with those of a large engraving company which specializes on Christmas cards the owners of the Morgan Engraving Company made up their minds to take an unbiased look at their own plant. It had grown from a small business to several times its original size and they found that the expansion had taken place without the careful planning necessary for efficient production.

Originally the company occupied one small building and later overflowed into an adjacent building. Each was wired for 220 volt single phase service and had a separate meter. The engraving presses were producing at the same rate as twenty years ago but labor costs had risen drastically and it had not been practicable to increase selling prices correspondingly because of competition. Obviously the only thing to do was to cut costs and increase production the way so many other businesses have had to do during recent years.

Upon making a careful study of each individual machine it was determined that an excessive amount of time was required to set them up for the right speed for the different jobs. This is important because there are substantial differences in the most efficient speed for each of the large variety of jobs which the company handles.

This was particularly true of the 4½ in. by 9 in. embossing press. Speed changes were made by means of three flat face paper pulleys and the belt length had to be changed every time the pulleys were changed. Due to the fact that it took considerable time to make these changes a job would be run in most cases at whatever speed the machine happened to be set for. Consequently when the speed was too slow production was lost; if it was too fast either spoilage was increased or the operator had to release the clutch after each impression.

In order to correct this difficulty the old single phase motor was equipped with a variable speed pulley which provided for any speed between 700 and 2800 impressions per hour. This made it easy to adjust quickly the speed of the press so that it is right for each job. By comparing the costs of production before and after this change it was evident that the new drive would pay for itself in a few months, after which the savings would accrue to the benefit of the company.



Photos: George J. Fix Co., Dallas, Texas

Fig. 1. One of embossing presses with modernized drive. Control wheel on right side of the press is used to change speed of the printing press as conditions dictate

Figure 1 shows this press after the new drive had been installed, complete with safety guards and convenient handwheel on the right side of the press for changing the speed. Figure 2 shows a close up view of the drive from the rear of the press.

As a result of this trial installation it was decided to convert the drives of several other presses to mechanical variable speed control. It was also decided to combine the whole electrical load on one three phase 220 volt circuit with a single meter.

This was done and at the same time two 1½ hp motorized variable speed changers were purchased for the drives of two 2½ by 4 in. embossing presses, giving a speed range of anything between 533 and 3200 impressions per hour. One of these drives is shown in Fig. 3. It will be noted that the drives are very compact and neat in appearance, and the speed adjusting handwheels are within easy reach. The motors of course, are three phase and

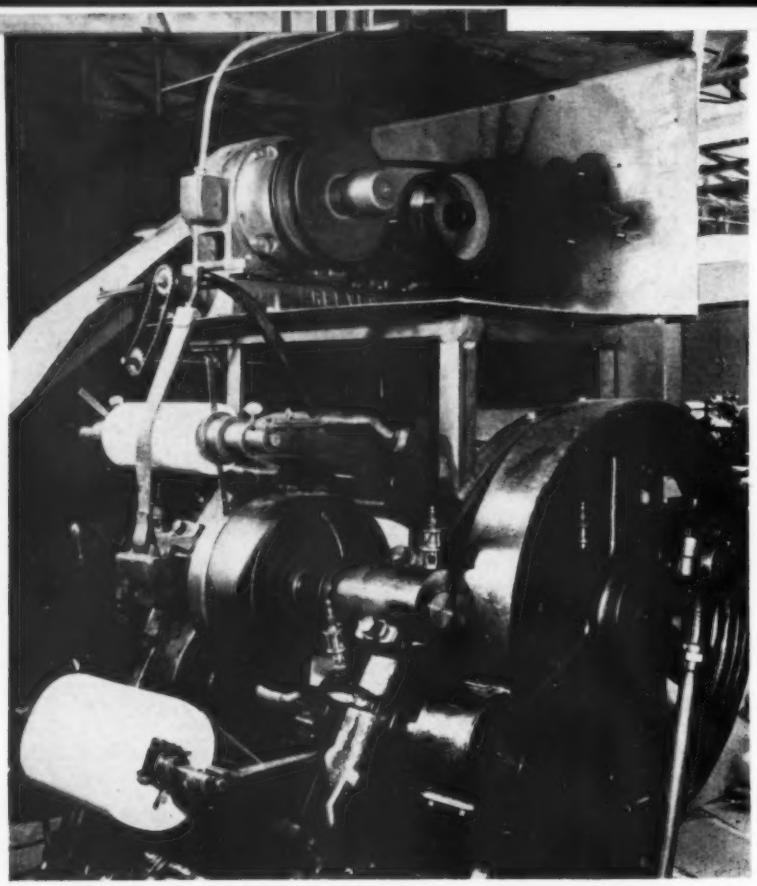


Fig. 2. Close-up of same drive on same machine as that shown in Figure 1. This shot taken from rear of press shows how little production space is needed for drive

replace all the old single phase motors.

The increase in production of these presses was even greater than expected at first and it became necessary to provide infra-red drying tables to eliminate damage due to ink smearing. One of these tables can be seen in Fig. 1.

At this time the single phase motor originally equipped with the variable speed pulley was replaced with a three phase motor, to which the variable speed pulley was transferred. It should also be pointed out here that the characteristics of the three phase motor make it the more efficient for all of the press drives. This particular drive may be seen in the close-up view in Fig. 2. Speed adjustments are made conveniently and quickly by the handwheel which drives the chain on the right hand side of the press which is shown in Fig. 1.

With these three presses converted to mechanical variable speed control, and with the whole electrical load on the one three phase circuit with one meter, the possibilities of increased production and reduced power costs became still more evident. There could now be no doubt that any additional modernization cost would soon be absorbed by savings.

Consequently another 2½ in. by 4 in. press, previously driven by a 1 hp variable speed, single phase, brush type motor, was provided with a 1½ hp motorized variable speed drive unit with the result that the maximum number of impressions per hour were doubled. At best this old drive was dangerous because when the larger sizes of dies were used the increase in pressure required caused the speed to drop considerably without changing the speed setting of the motor. As a result it was very difficult to maintain a given speed and the consequent safety hazard made it necessary to employ only the highest skilled operator on this press.

The new modern drive provides for speed variation of anything between 533 and 3200 impressions, the safety hazard is eliminated and uniformity of output secured. The handwheel for making speed adjustments is conveniently located, as are the electrical controls for the motor. Due to the greatly increased rate of production another infra-red drying table has been installed to make sure that the ink would be dried as fast as the press can produce impressions.

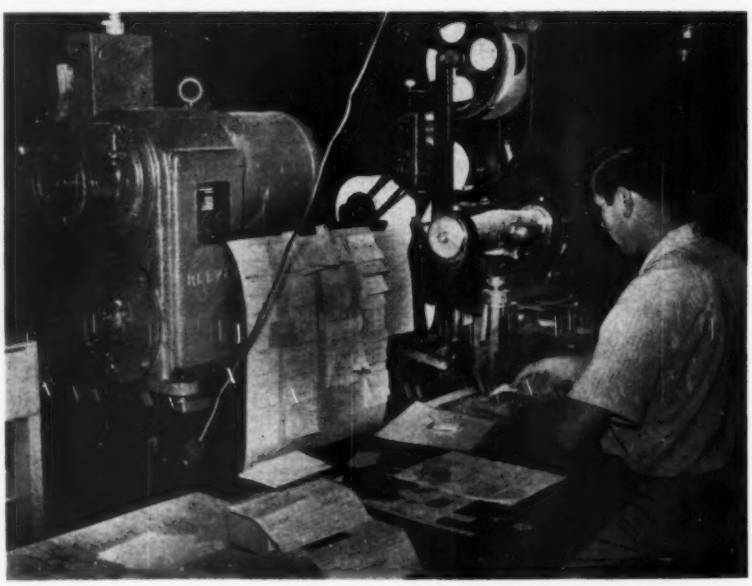
Special Presses

A 6 in. by 10 in. press which is used only for special jobs was also equipped with a 5 hp variable speed motor pulley to give a maximum of 1700 impressions per hour. This is a relatively slow machine under any circumstances and is economical to use only for large work. Its main purpose, now that the output of the other presses has been so greatly increased by their variable speed drives, is for short run jobs.

A new 3 in. by 8 in. press has just been received and is driven by a 2 hp motorized variable speed control unit to give a range of 433 to 2800 impressions per hour.

The company is now looking forward to the time when additional equipment can be purchased and is making plans for expansion even now. Benefits of up to date speed control have been outstandingly demonstrated.

Fig. 3. Another press whose drive was modernized. This is a 2½ in. by 4 in. embossing press with speed range between 533 and 3200 impressions per hour



With glass fiber-reinforced plastics playing a more prominent role in industry, it is important that the right equipment is used for . . .

CUTTING, FINISHING PLASTICS

By R. T. ARGY, Abrasive Engineer,
Coated Products Div., The Carborundum Co.

Fig. 1. Panel is cut out of automobile body with straight wheel made of molded cotton fiber impregnated with resin

GLASS fiber-reinforced plastics are either already in use or are being seriously considered as primary structural materials in almost every field of construction.

A basic manufacturing problem which is now being given serious attention by fabricators is how to machine and polish-grind these materials economically and efficiently. The existence of the glass fiber-reinforcing material, as the strengthening member, presents certain obstacles to the machining and grinding operations; obstacles which prevent the adoption of the methods used on conventional plastics.

In general, the material being cut by a machine tool or abrasive grain is subjected to mechanical forces which cause it to fail along predetermined surfaces. The resistance which the material exerts against the tool determines the efficiency of the grinding operation.

A satisfactory machining cut, made with a milling, sawing, drilling or other tool on a homogeneous ductile material such as a metal, removes a long uniform chip or curl. The cutting edge shears through the material, leaving a groove with smooth sides. The tool, in this case, is appreciably harder than the material being cut.

This same tool will not perform the same smooth operation on a piece of glass fiber-reinforced plastic, however, for the following reasons:

1. The material is not homogeneous. The tool passes through the plastic portion with ease, but when it encounters a glass fiber, it must tear its way through. The result is a ragged section in the wall of the groove.

2. When the tool edge contacts the glass, it encounters a material harder than itself. The result is a dull tool.

A characteristic of glass fiber-reinforced plastic is its lower resistance to abrasion. From the standpoint of machining and grinding, however, this characteristic becomes a virtue. Because of this most operations which can be performed with an abrasive tool can be done more economically.

Performance Comparison

This may be illustrated by comparing the performance of a high speed steel circular saw with that of a glass fabric-reinforced resinoid grinding wheel in the cutting of glass-melamine electrical laminates. The saw, which costs $16 to $18 new, performs for about two hours, after which time it requires sharpening. It may be resharpened some 25 to 30 times, at $2 per sharpening. The abrasive wheel, on the other hand, costs only $2 initially. Its effective life is also about two hours, in which period of time it removes as much volume of material as the saw. (Data reported by Dr. Ralph Witt, Johns Hopkins University.)

In the sanding or grinding of many materials, including metals, woods, protective and decorative coatings, etc., the life of an abrasive product is limited by the loading of the cutting surface with chips of the abraded material. Except for a few instances, where polyester resin surfaces are incompletely cured, loading is not a serious problem in the grinding of reinforced plastics.

Most of the dust is dry and does not smear over the abrasive. That which does accumulate is readily removed by a blast from an air hose.

Abrasive products are obtainable in two forms:

1. Bonded abrasives, which include grinding wheels, cut-off wheels and abrasive stones.

2. Coated abrasives, which include flat sheets, belts and discs.

In the metalworking industries, the bonded products are generally used for heavy stock removal, precision grinding and surface finishing. Coated products find extensive use for grinding of welds, grinding rough edges, deburring and polishing. In woodworking, coated abrasives are employed in heavy stock removal as well as surfacing.

In the glass fiber-reinforced plastics industry, silicon carbide resinoid cut-off wheels are recommended for most major cutting, trimming and turning operations. The cut-off wheels that will prove most useful, however, are the glass fiber-reinforced and cotton fiber-reinforced types. They may be used on either portable or bench mounted tools. These wheels may be used in the cutting of patterns having curved lines 3 in. in diameter. For less than 3 in. diameters, hand sawing is necessary.

Reinforced cut-off wheels have three outstanding features: (1) they have substantial strength; (2) they allow a high speed of cut; and (3) they have a long life as compared with metal saws. A typical cut-off operation is shown in Fig. 1.

There are many operations in which surface or edge finishing is required. Various types of abrasive products are available to the fabricator which will perform these operations efficiently,

particularly when used in conjunction with the proper mechanical equipment. Although a few minor finishing jobs can be accomplished by hand sanding, both time and money will invariably be saved through the use of mechanical sanding equipment.

Surfacing problems in the reinforced plastics industry are encountered in three areas: (1) in preparing a surface for coating; (2) in removing wrinkles and other blemishes; and (3) in removing light flash or smoothing rough-cut edges.

In preparing a surface for coatings, two factors are important. First, in order to obtain good adhesion between the paint film and the surface, all mold lubricant must be removed. Second, even though a parting film of cellophane or polyvinyl alcohol is used, most coatings will adhere better if the top surface of the plastic is removed.

Such a surfacing operation is best accomplished with a flexible pad and waterproof discs. It may be performed either wet or dry. When done wet, a stream of water is used to eliminate dust as well as to decrease the loading of the abrasive with abraded material. In this case an air driven grinding head is recommended.

The flexible pad, shown in Fig. 2, consists of a sponge rubber disc, attached to a sander pad. The abrasive disc is held to the face of the rubber pad by means of a pressure-sensitive adhesive.

Due to its cushion-type, resilient rubber pad construction, the flexible pad sands contours better than any other mechanical tool, because it follows convex and concave curves with ease. Moreover, the pressure-sensitive adhesive permits easy removal of discs. In addition, no point pressure is developed during use, and a feathered-edge is easily obtained.

Another pad, similar in construction to the flexible pad, is of slightly harder rubber and therefore produces a more aggressive grinding action. The pad face takes an 8-in. paper disc and the backing sander pad is 5 in. in diameter.

The recommended procedure for using either pad is to adhere a waterproof paper disc to the surface and then sand, using a slow speed, 1500 rpm air tool. To get water to the job for wet sanding, a ¼ in. line, equipped with a thumb valve, can be attached to the tool.

In the removal of wrinkles and surface blemishes, there are three tools available, the use of which depends upon type and size of the workpiece.

For large surface areas, such as the top of a car body, the flexible pad proves most useful. For the curved surfaces of automobile fenders, for example, a portable belt grinder is suggested.

This belt sander, shown in use in Fig. 3, permits the use of abrasive belts on straight-spindle air and electric portable tools. It consists of an idler pulley, a supporting mechanism and a contact wheel, and is particularly suited for the awkward, hard-to-get-at jobs encountered in the fabrication of automobile bodies.

Available in two sizes, one using a 2 by 20 in. belt and the other a 1 by 12 in. belt, the portable belt sander is useful in many applications. With it, operating costs have been reduced 50 per cent in some cases due to the fact that (1) more abrasive surface is available, and (2) the abrasive surface is completely utilized. Freedom from chatter, smoothness of finish, and ease of handling are other features which add to the usefulness of the sander.

Grinding is done on either the surface of the belt over the contact wheel, Fig. 3, or on the slack-of-belt between the wheel and the pulley. For raised blemishes, the wheel surface is used, while for larger areas and for mirror finishing, use slack-of-belt technique.

A third grinding tool is the multi-purpose belt grinder, Fig. 4, which is most useful in the abrasive machining of small parts. This unit can be easily set up to function vertically, horizontally or at any angle in-between, in increments of 15 deg.

This unusual degree of flexibility permits the grinder to be used for a number of grinding operations, including tilted platen, off-hand, vertical platen, slack-of-belt and contour grinding. It can be adjusted at the most convenient height for the operator in either standing or sitting positions.

In removing flash and sanding rough edges, both the portable belt grinder and the multi-purpose stationary unit are recommended, depending on the job. For a large regular shape, such as a laundry tub, the portable tool may be mounted on a jig so that the piece may be removed from the press, placed on a turntable and fed by hand under the contact wheel. For small parts, the stationary tool may be used by a single operator to trim pieces as soon as they are cured.

Both coated and bonded abrasives are available in various abrasive types and grit sizes. Machining and finishing are technical problems. The proper selection of abrasives and the tools with which to use them can speed production and cut costs.

Fig. 2. Flash is removed from taillight housing, using flexible pad, portable tool

Fig. 3. Deburring inside of headlight opening is done with sand grinder

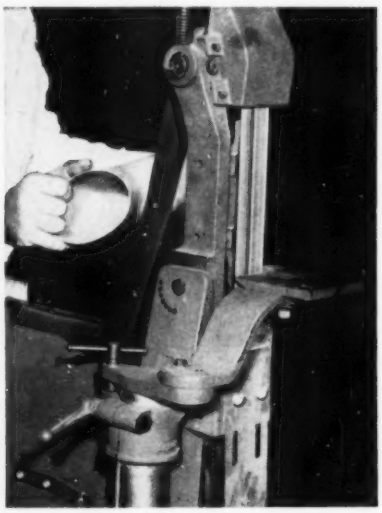
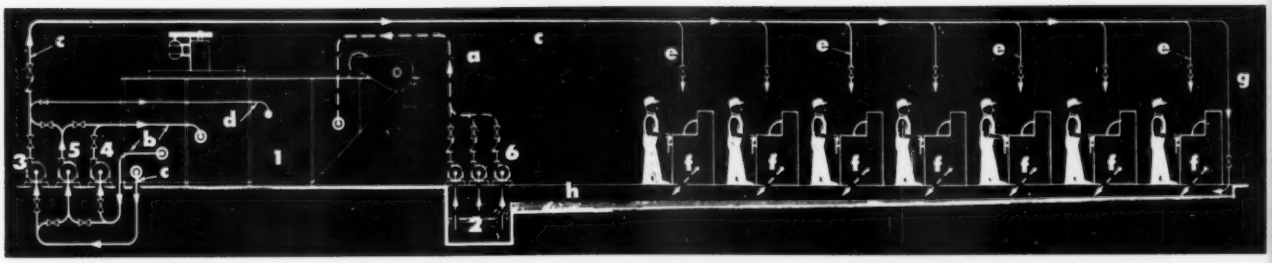


Fig. 4. Aircraft heating and ventilating duct is surface ground with belt grinder



This schematic drawing shows complete filtration cycle. A: Dirty coolant line; B: Flotation cell feed; C: Clean supply; D: Spray header; E: Grinder drop; F: Grinder drain; G: Flush line; H: Gravity trench. Equipment key shows, 1: Flotation unit; 2: Self-cleaning sump tank; 3: 7½ hp. clean supply pump; 4: 5 hp. Cell feed pump; 5: 7½ hp. Stand-by pump common to clean supply and cell feed pumps (3 and 4); 6: 5 hp. Sump pumps, one a stand-by

Filtration Saves Thousands in Maintenance and Materials

Besides the labor of cleaning all individual grinder sumps, plus maintenance of sump pumps, this company had to discard 2200 gal of coolant every week . . . A lot of this money has been saved with the new filtration system

MAINTENANCE NECESSARY in connection with varied grinding operations on parts for signal systems was costing the General Railway Signal Company, Rochester, N. Y., a sizable sum of money. Cleaning the grinding machine sumps cost $3800 yearly for labor, while maintenance of the sump pumps also required a considerable annual outlay.

In addition, $1152 a year had to be spent on coolants for the grinding operations, and losses in raw materials through rejects due to poor finish were excessive.

These conditions finally made it apparent that coolant filtration equipment should be installed. After this was done no labor had to be diverted to cleaning grinder sumps, coolant costs were reduced to $600 a year, maintenance on the sump pumps was eliminated, and rejects were minimal.

Before a continuous filtration system was installed the oil used as a coolant in the grinding operations became highly contaminated in a short time. The continued use of this oil over a period of a week caused the contaminating metal particles to become imbedded in the surface of the grinding wheel which impaired product finish and necessitated frequent wheel dressings. Not only was production slowed, but all individual grinder sumps had to be cleaned each week and 220 gal of oil discarded.

After a thorough study of known methods and equipment available for coolant purification, it was decided to install a central filtration system for coolant restoration. A Model 56 Hoffman Flotation Clarifier, 300 gpm, was chosen as the oil filtration unit and around this the central system was designed.

When the system was set up the benefits of filtration became evident immediately. Clean oil was delivered to the grinders continuously and wheel dressings were reduced 50 per cent, thereby doubling grinding wheel life. The coolant was no longer discarded each week. Oil replacement took place only once in eight months reducing coolant cost to $600 a year. With filtration, machine sumps no longer had to be cleaned at all, saving $3800 annually.

Another important benefit was that with clean oil being delivered constantly there were no more metal particles to interfere with grinding operations or to impair the product finish. The result of all these other improvements was that rejects were reduced to a minimum, saving thousands of dollars yearly. Finally, with the filtration system it was no longer necessary to furnish maintenance for the 19 individual grinder sump pumps since they were discontinued.

Besides the clarifying unit the equipment consists of necessary pumps, overhead clean coolant supply lines to the grinders, and floor trenches for gravity drainage of dirty coolant to the self-cleaning sump tank located beneath the floor.

The filtration cycle begins as the dirty oil leaves the grinders and flows down the drainage trench to the dirty coolant sump tank which is constructed with a baffle in the rear to maintain constant agitation. This is done by the force of the oil flow and is necessary to prevent settlement of particles.

Next, the oil is transferred by two motor pumps from the sub-floor sump tank to the Hoffman flotation unit. A spare pump, located in the sump tank, acts as a standby and is operated by a float and cut-in switch. This prevents possible overflow.

If the dirty coolant rises too far the float trips the extra pump switch and the excess oil is pumped out. In reverse, if the coolant level drops too far for proper operation the float trips another switch and the pumps are stopped until the desired operating level is restored. In the Hoffman unit there is another tank for settlement of the heavier contaminant particles before the coolant is pumped into the flotation cell.

In the flotation cell a rotor-stator assembly produces a dispersion of bubbles which entrains the insolubles. This froth is removed by a pair of skimmers driven by a separate motor through a speed reducing unit and dropped back into the dirty coolant section where a spray assists in the settling out process.

An automatic drag chain conveyor, mounted with a series of scraper flights and driven at slow speeds to permit maximum oil drainage, drags the sludge up an incline and dumps it in a removal cart. Clean oil flows at all times from the flotation cell into the clean oil section of the tank where it is pumped out through overhead pipelines to the grinders, clarified and ready for re-use.

POWER FACTOR Can Be Measured by

By C. SPAIN, JR., Consulting and Application Engineering, Westinghouse Electric Corp.

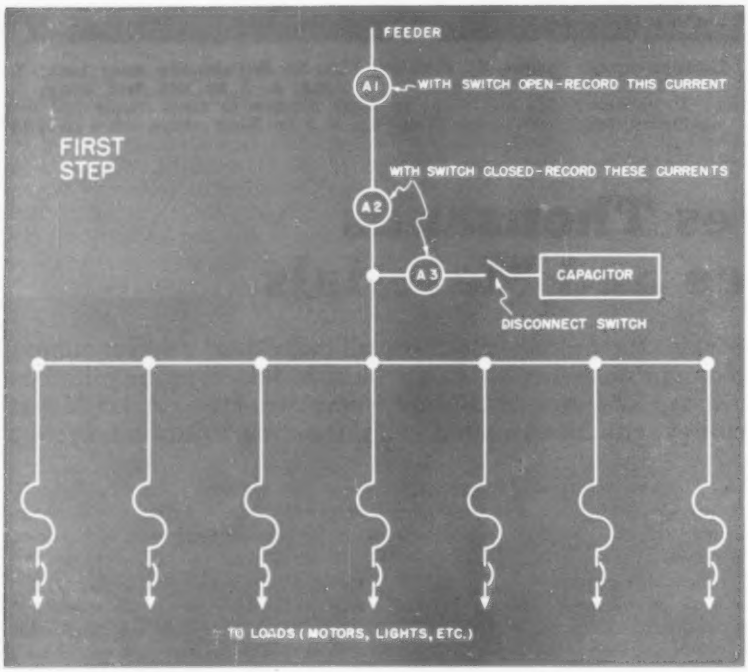


Fig. 1. Diagram of feeder circuit showing location of ammeter, capacitor, switch

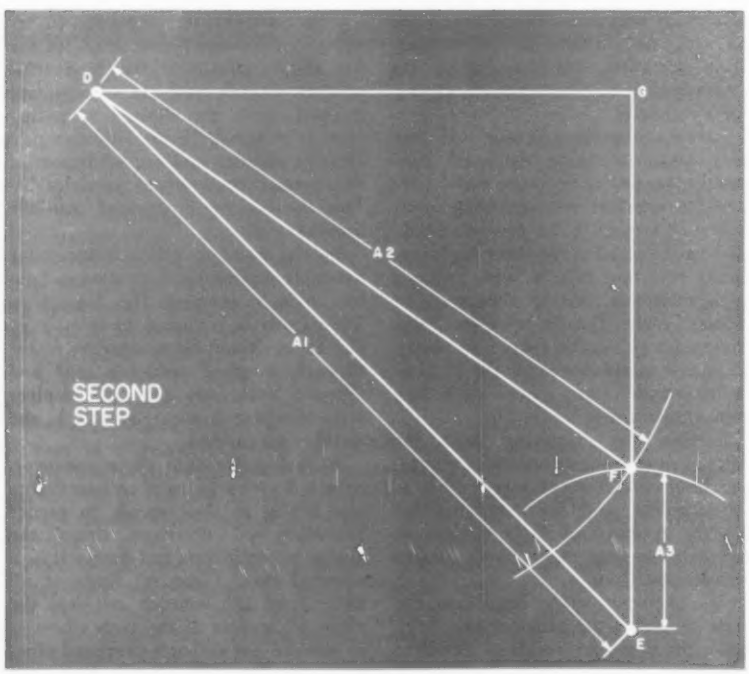


Fig. 2. This is diagram drawn on a sheet of paper to determine power factor

Most conventional methods for measuring power factor in plants require special instruments . . . These instruments usually require use of current transformers which must be inserted in circuit to be measured. . . This results in feeder shut-down and loss of time and production . . . Here's a simple way to measure power factor

POWER FACTOR can be measured in a feeder using only a clamp-on type ammeter, which is standard equipment in most industrial plants. In addition to this one instrument, the only other equipment required is a three-phase capacitor and a disconnecting switch. The kvar rating of the capacitor is not important so long as it has a voltage rating equal to or greater than the feeder to be measured. That is, a 460-volt capacitor may be used on a 230-volt or a 460-volt circuit. It is also desirable to have the kvar rating of the capacitor equal to or greater than 10 per cent of the kva in the feeder circuit to insure maximum accuracy.

Power factor measurement is made by taking only three readings and drawing a diagram. Referring to Fig. 1, which is a one-line diagram of a typical feeder circuit showing location of ammeter, capacitor, and disconnecting switch:

1. **With switch open, record Current A-1;**
2. **With switch closed, record Currents A-2 and A-3;**
3. **Repeat these readings until a good average reading is obtained.**

On a large sheet of paper, draw a straight line and mark points "D" and "E" so that the distance between them is proportional to current A-1. (For instance, one ampere can equal one-tenth inch, or 100 amperes can equal ten inches.) This is shown in Fig. 2.

It is desirable to draw this line at an angle from the horizontal which approximates the *suspected* power factor angle, although this is not necessary. Next, using Point E as center, scribe an arc whose radius is current

A-3 (using same scale as before). Scribe a second arc with Point D as center whose radius is current A-2. Again, use the same scale.

The intersection of the two arcs will give Point F. Extend line E-F far enough so that line D-G may be drawn perpendicular to line E-F-G. Measure line D-G. The power factor of the feeder is then the ratio D-G divided by D-E or:

$$PF = \frac{DG}{DE}$$

Now that the power factor diagram has been constructed, it is possible to determine quite readily the actual kilowatt load on the particular feeder. It is also a simple matter to determine kvar of capacitors required to bring this feeder power factor up to any desired value. To determine kilowatts in the feeder, use the following formula:

$$KW = \frac{DG\sqrt{3 \times E}}{1000}$$

Where:

KW = Kilowatts load
DG = Current in amperes
E = Line-to-line feeder voltage

To determine capacitor kvar required to correct feeder to any desired power factor, refer to Fig. 3. Figure 3 is a reconstruction of Fig. 2 with line DF omitted. For instance, if it is desired to correct power factor to 90 per cent, an arc is scribed with D as center and with radius equal to DG divided by 0.90. This arc will intersect line EG at point H. Capacitor kvar required to correct feeder to 90 per cent power factor will be:

$$kvar = \frac{HE\sqrt{3 \times E}}{1000}$$

Where:

HE = Current in amperes
E = Line-to-line feeder voltage

For those who prefer the mathematical approach, which requires no drawing of current diagrams, it can be shown that:

Power Factor =

$$\sqrt{1-\left[\frac{(A1)^2+(A3)^2-(A2)^2}{2\,(A1)\,(A3)}\right]^2}$$

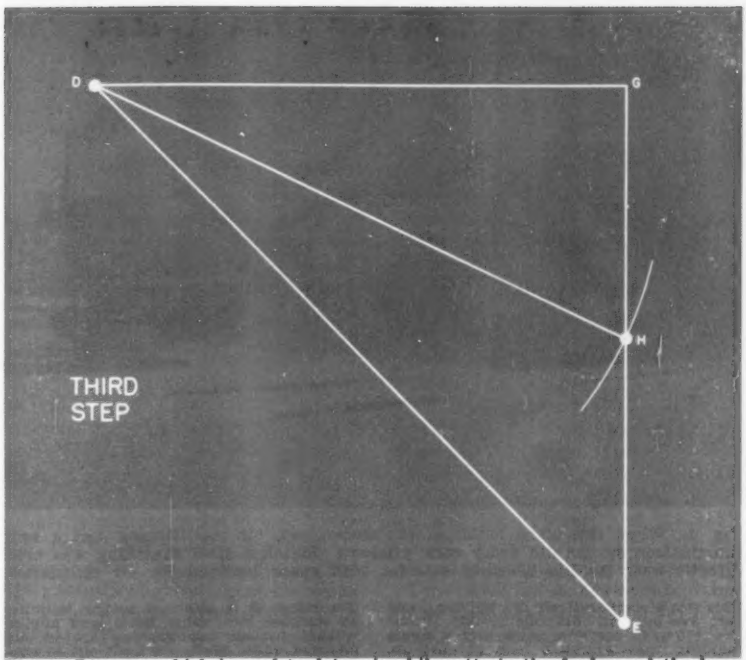


Fig. 3. Diagram which is used to determine kilowatts in the feeder and the kvar of capacitors which will be needed to correct the power factor to any desired value

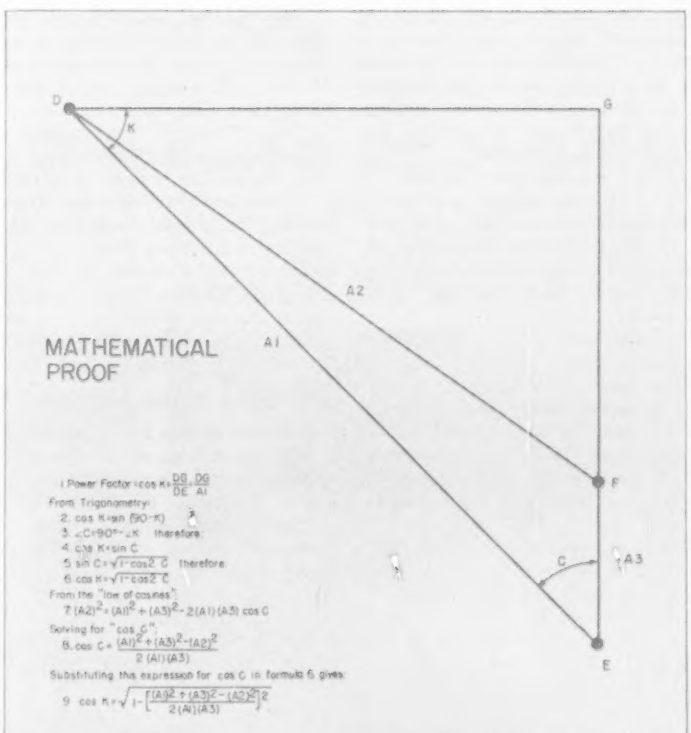

D
G
K
A2
A1
MATHEMATICAL
PROOF
F
C
A3
E
1 Power Factor = cos K = DG/DE = DG/A1
From Trigonometry:
2 cos K = sin (90° - K)
3 ∠C = 90° - ∠K therefore
4 cos K = sin C
5 sin C = √(1 - cos² C) therefore
6 cos K = √(1 - cos² C)
From the "law of cosines":
7 (A2)² = (A1)² + (A3)² - 2(A1)(A3) cos C
Solving for "cos C":
8 cos C = [(A1)² + (A3)² - (A2)²] / 2(A1)(A3)
Substituting this expression for cos C in formula 6 gives
9 cos K = √(1 - [((A1)² + (A3)² - (A2)²) / 2(A1)(A3)]²)

Fig. 4. Here is the proof of the formula used to determine the power factor

Stainless Steel—

Uses
Abuses
Forms
Finishes

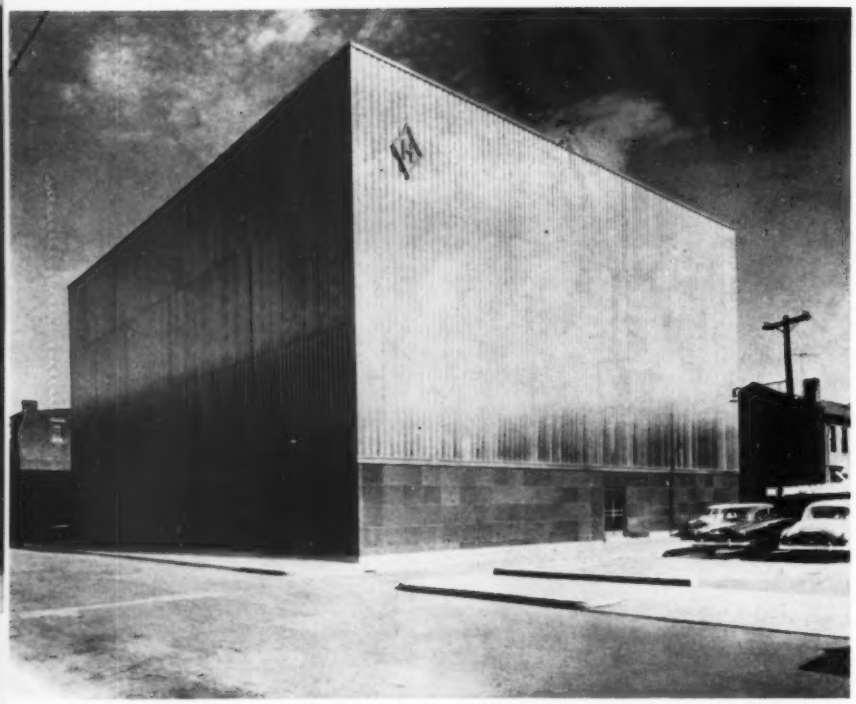


Fig. 1. When this office building was modernized, air conditioning and a new illumination system did away with windows. Stainless steel sheathing was used directly over the old masonry exterior with space between for air circulation

This was a comparatively old building; one part was built in 1918, one in 1923. Problem: How to combine parts into a single building that wouldn't look patched-up. The sheathing is Type 440 stainless, vertically-fluted panels for strength and decorative value; it is attached to the building by stainless steel clips, bolts, and angles. Intakes for air conditioning are in old masonry walls. Walls are built-out to provide air space between. Fresh air comes in at bottom; discharged air flows out at top

IT is possible for the plant engineer to use stainless steel wherever he turns. The machinery and equipment in his plant may be made entirely or in part of stainless steel. Stainless steel may be used by him in the structure of his plant as walls, doors, roofing, flashing, gutters and downspouts, and in decorative applications.

He uses stainless steel for other facilities which he designs and builds. Examples are hoods, vents, and ducting; drip collection and drain systems; railings, bump guards, and scuff plates; chutes, tables, platforms, and trays; and special-purpose fixtures.

In some industries, such as food processing, extensive use of stainless steel is mandatory. But in most industries there are many materials which could be used. Of these, stainless steel is usually not the lowest in first cost. Yet, its popularity is growing, and its list of applications is increasing rapidly.

The explanation is that stainless steel has a combination of properties that add up to low overall cost. It lasts for a long time, and it is easy and inexpensive to maintain throughout this long life.

First of all, stainless steel is resistant to corrosion. Under oxidizing conditions ranging from exposure to moist air, to boiling in nitric acid, stainless steel has a nobility approaching that of platinum.

Stainless steel does not need painting, either to protect it or to make it attractive. With no surface coating to wear off, chip, or crack, maintenance costs like repainting or replating are eliminated. Replacement due to fracture of a brittle surface or wear of a soft surface is never required.

The surface of stainless steel is hard, smooth, and abrasion resistant. Many stainless steels work-harden, becoming more resistant to wear the more they are used. Because there are no corrosion products to remove, it is necessary to remove part of the surface of the steel during maintenance.

Many Types Available

Stainless steel is strong, and retains a high percentage of its strength at elevated temperatures and under corrosive conditions. It is chemically inert under most plant conditions, so it can't add to nor subtract from the color, flavor, or other characteristics of products it contacts.

The only maintenance stainless steel normally requires is cleaning, and it cleans easily. Its smooth, hard, dense surface does not easily catch and retain surface deposits, and deposits are thus readily removed.

No one material could have all these qualities in the optimum combination for all applications. So, there are more than 30 standard types of stainless steel available, each with a slightly different combination of properties. Basically, the stainless family is divided into three groups: the 12-per cent chromium types; the 17-per cent chromium types; and the 18-8's.

The 18-8's contain about 18 per cent chromium and 8 per cent nickel. They have excellent physical properties, and have the highest corrosion resistance of all stainless steels. Their resistance to oxidation is good, even at high temperatures. Creep strength is high, even at high temperatures. The 18-8's are not hardenable by heat treatment, but cold-working hardens them and produces high tensile strength.

The 18-8's are well suited for all types of fabrication, including drawing, spinning, machining, forging, and welding. They can be brazed and soldered, though this may lower their corrosion resistance under certain conditions.

The basic 18-8 stainless steel is Type 302, which has such a good combination of properties that it is the most widely used of the chromium-nickel grades. Type 301 is a modification intended to develop especially high strength upon cold working. Type 303 is a free-machining version of the

basic 18-8 type. Type 304 has a reduced carbon content, to give it better corrosion resistance following welding. Type 305 has minimum work-hardening characteristics among the 18-8's. Type 309 has extra percentages of chromium and nickel, for added heat resistance as high as 1800 F. Type 310 is formulated for even higher heat resistance. Molybdenum added to Type 316 gives it the highest corrosion resistance of all the standard stainless steels. It is especially resistant to pitting from brine or sulfur-bearing water.

Type 302 stainless steel precipitates chromium carbides when heated and held in the "sensitizing range" of 800 to 1600 F. Such precipitation may become critical during welding, since the area behind and alongside the weld will be in this critical range. For certain service conditions this area might be vulnerable to intergranular corrosion because of depletion of chromium in solution. It is advisable to anneal Type 302 after welding, to return the chromium to solution if corrosion resistance to active corrodents is a requirement of the equipment. Type 304, with reduced carbon, does not precipitate as much chromium carbide as Type 302, so annealing is not usually necessary.

The possibility of carbide precipitation does not limit the use of equipment under most conditions. However if equipment which is to be subject to severe corrosion will be in the sensitizing range in service, or if thick complicated sections are welded and annealing is not practical, a means of dealing with the problem is to use stabilized stainless alloys Type 321 or Type 347. Type 321 contains titanium, and 347 columbium, to control carbide precipitation.

The 12 per cent chromium stainless steels are well suited to applications requiring high strength, high hardness, and resistance to abrasion combined with corrosion resistance. These are the most popular stainless steels for mechanical parts.

The 400 Series

Cold forming characteristics of the 12 per cent chromium group are fair; for hot-forming, these steels are excellent. Type 403, 410, 414, 416, and 440 are hardenable by heat treatment.

The basic and most commonly-used member of the 12 per cent chromium group is Type 410. It can attain excellent physical properties through heat treatment, and is well suited for cold heading and severe forming. It is weldable, although for shock-resistant welds annealing is recommended.

Type 403 is a 12 per cent type primarily used for steam turbine blades and similar high-stress, high-temperature, wet-abrasion applications. Type 414 attains a slightly higher corrosion resistance when heat treated than Type 410 does. Type 416 is a free-machining modification of Type 410. Type 420 is intended for applications where high hardness is a prime requirement.

The highest hardness among the stainless steels is attained by heat treatment of the three modifications of Type 440. When fully-hardened, this type has higher corrosion and heat resistance than the 12 per cent chromium group, because its chromium content is 16 to 18 per cent.

The third class into which stainless steels may be divided includes all those, except the Type 440 just mentioned, with a nominal chromium content of 17 per cent, and little or no nickel. These combine excellent corrosion and heat resistance and a low coefficient of expansion. Because of these properties, these stainless steels are favored for applications involving intermittent heating to high temperatures. Their high oxidation resistance minimizes scale formation, and the low coefficient of expansion minimizes the tendency of the protective scale to crack off when temperatures change.

These 17 per cent chromium steels, Types 430, 430T, 430F, and 446, are not hardenable by heat treatment, and are not changed appreciably by cold work.

The best-known of these steels is Type 430. It combines mechanical properties similar to medium carbon steel, with good corrosion resistance. It is well suited for stamping, drawing, and roll-forming; and for cold-heading. Resistance to nitric acid and hot sulfur-bearing gases is excellent.

Type 430T is a non-standard but widely-used modification of Type 430 containing titanium to improve welding characteristics. Type 430F is a free-machining modification. Type 446 is intended for high temperature applications, particularly in the chemical industry, where high corrosion resistance is required and top strength is not a necessity. Its resistance to scaling and to sulfur-bearing gases at high temperatures is excellent. Type 446 has the lowest coefficient of expansion of all the stainless steels—almost as low

Fig. 2. Stainless steel is used extensively in food processing equipment such as these tanks in a cranberry processing plant

Wherever food is processed, health laws are strict about equipment which can be used. It must be rust-proof and not subject to attack by any of the chemicals in the food. It must be smooth, with no pits or crevices which could harbor bacteria. Stainless steel can be fabricated easily to have a smooth, hard surface. It neither adds to nor detracts from, the flavor or color of the product. It is easy to wash and can stand repeated washing. High surface finish shows up dirt, makes inspection easy

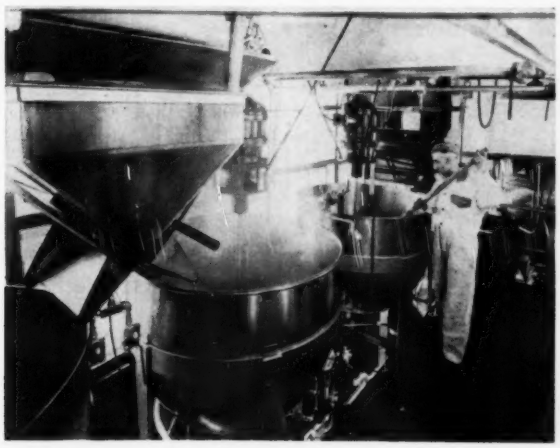
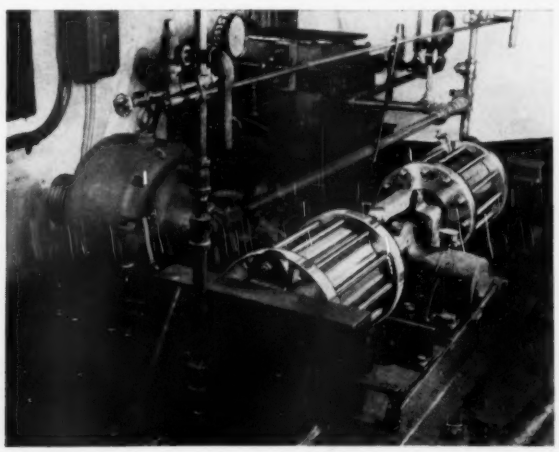


Fig. 3. This pump furnishes high-pressure distilled water for splitting mica. Contamination prevented by stainless

Distilled water is forced through fine holes in stainless steel tubes into disintegrator chambers where it splits the mica flakes. When the split chips are thin enough they pass through a screen onto a nylon belt supported by stainless steel wire mesh, and adhere to each other to form a mica sheet. The pump cylinders—which are 10 in. in diameter and 14 in. in length—are of stainless steel. The pistons operate without lubrication, to prevent contamination which might impair the insulating capacities of the mica



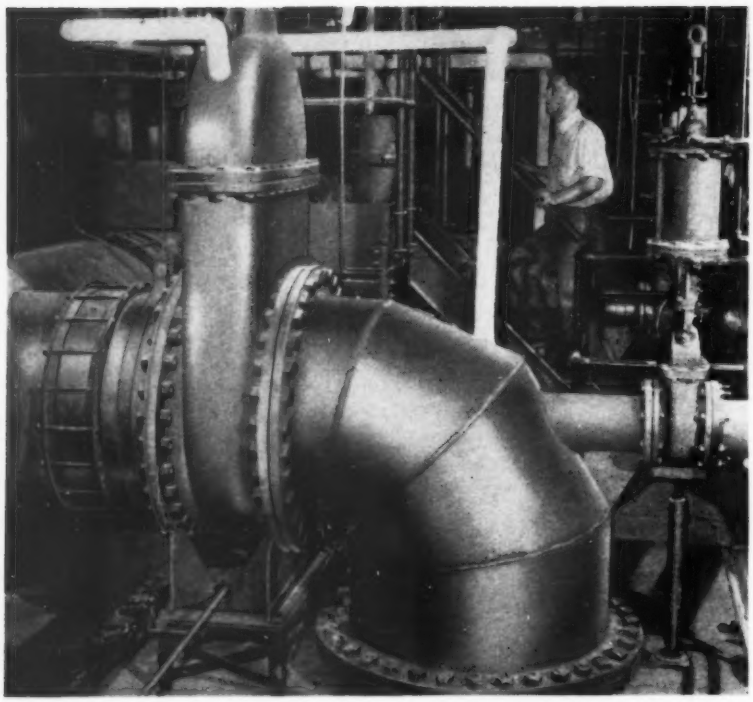


Fig. 4. This valve and elbow are part of a stainless steel piping system for solvent vapors. System is used for reclaiming ink in large printing plant

Here, too, no contamination can be tolerated; ink will not flow properly, colors will vary, and paper may be stained if impurities are present. Stainless is inert in presence of this solvent, so it is used for piping, valve parts, vessel linings and everywhere else that vapor or liquid solvent may come into contact with metal parts

as the expansion coefficient of glass.

There are considerations in design, fabrication, service, conditions, and cleaning, which affect the ability of stainless steel to give the long low-maintenance life of which it is capable.

Remembering the previously-mentioned considerations about carbide precipitation in welding, for example, one can avoid possibility of lowering corrosion resistance in those cases where this might be a factor.

Aside from precautions connected with welding, the only corrosion-resistance most plant engineers have to face where stainless steel is concerned is the pitting which may occur when the stainless is sealed off from oxygen, under corrosive conditions, for considerable periods of time.

It is generally believed that what protects stainless steel from corrosion is a non-porous coat of chromium oxide, so thin as to be invisible. When broken or penetrated in any way, this protective film reforms immediately if oxygen is available.

When something prevents access of oxygen to the surface, and traps corrosion-bearing moisture against the surface, then oxidation-reduction cells may be set up. In time, these can pit the surface of the stainless steel.

So in design, sharp inside corners, small internal radii, crevices, and other hard-to-clean spots should be avoided. Seams should be kept to a minimum, and welds ground smooth. These places can trap foreign matter where it is difficult to remove, and pitting might result.

Faying surfaces of joints between stainless steel and other metals should be avoided or insulated. Also, avoid contact between stainless steel and wood or other porous materials. They absorb and slowly build up concentrations of corrodents, which, in the restricted oxygen-poor area of a joint, can cause active corrosion. Gaskets or packings containing graphitic ma-

Fig. 5. Curtain walls, flashing, decorative trim and sign letter are made of stainless steel in this Baltimore warehouse

terials can accelerate corrosive action if it occurs. Plastics, fiber, or synthetics should be specified instead. Asphaltum or zinc chromate paints should separate stainless steel from wood or other porous materials.

Ordinarily, stainless steels can be washed clean with plain water, or water with soap or detergent. Greasy deposits may require a solvent such as naphtha or carbon tetrachloride.

If a deposit has been allowed to cake or harden, some mild abrasive such as pumice or Bon Ami, aided if necessary by a stainless steel wire brush or stainless steel wool, may be required. This cleaning is facilitated by the fact that stainless steel has a surface which is hard, and if properly fabricated, smooth. So, foreign matter does not cling stubbornly.

In cleaning stainless steel, avoid cleaners which contain halogens. Hydrochloric acid, hypochlorites, and other halogens can impair stainless steel's self-renewing protective coating if not neutralized or at least thoroughly flushed off immediately after using. With proper precautions such cleaners are not harmful, but it is easier to use one of the many cleaning agents which cannot harm stainless at all.

Never clean stainless steel with brushes or wool made of other metals. They can leave particles imbedded in the surface, where they can corrode.

STEEL MILL STAINLESS PRODUCTS
Forms and Finishes Available

Stainless steels are available in virtually all forms and sizes as other metals. The mill products include:

BARS AND STRUCTURAL SHAPES

Hot rolled bars:

Rounds—Squares—Flats
Angles—Channels—Tees.
Hexagons, Octagons and other special shapes are also available from various mills.

Cold finished bars:

Rounds—cold drawn, ground or rough turned
Squares—cold drawn
Flats—cold drawn
Half ovals—cold drawn
Hexagons—cold drawn
Octagons—cold drawn
Special shapes—cold drawn (on application)

Surface Finishes

Scale not removed (hot finish)
Pickled or blast cleaned
Cold drawn
Turned
Centerless ground
Polished

Bars can also be had in **mirror finish quality** (for cutlery and other parts which must be polished highly) and in **aircraft quality** used for highly stressed parts.

Specifications as to Length:

Random Lengths: Variation customarily not less than 24 inches.

Multiple Lengths: 1/4 inch customarily added to length of each bar for each multiple.

Note: On size allowance for turning machine straightened bars make the following allowances for possible out-of-round:

Nom. diam. hot rolled bar	Min. allow. on diameter
1 1/2—3 in. inclus.	1/8 in.
3 —6 in. inclus.	1/4 in.
6 —8 in. inclus.	3/8 in.

PIPE AND TUBING

Pipe—In diameters and thicknesses as outlined in Americn Standards Association Schedules as well as special light weight schedule 5.

Tubing—Welded up to 30" outside diameter Seamless up to 8 5/8" outside diameter.

Shapes—Square tubing and other shapes in sizes which can be formed from an 8 5/8" or smaller round tube.

Finishes—In general all round tubing can be polished. Square or special shapes can be drawn from polished round tubing.

Types of finishes:

No. 2—Annealed and pickled
No. 2A—Pickled, not annealed (semi-hard)
No. 2B—Bright annealed
80 Grit—Standard ground finish
120 Grit—Semi-polished finish
180 Grit—Standard polished finish
240 Grit—Special polished finish
320 Grit—Mirror Finish

PLATES:

Are made in thicknesses 3/16" and over in virtually all sizes available in other metals. Plates are also made of stainless steel clad on one or both sides of a carbon steel backing.

Conditions and Finishes

Hot rolled—Scale not removed. Not heat treated.

Hot rolled, annealed or heat treated—Scale not removed. Use for heat resisting applications. Scale impairs corrosion resistance.

Hot rolled, annealed or heat treated, blast cleaned or pickled—Preferred for corrosion and most heat resisting applications.

Hot rolled, annealed or heat treated, surface cleaned and polished—Generally No. 4 finish.

Note: In designating plate sizes the greater of two surface dimensions is generally considered length. Specify length direction when direction of rolling is important. Specify plate thicknesses in the following increments:

Range, in.	Increments, in.
3/16—3/8 incl.	1/16
3/8—2 incl.	1/8
Over 2	1/4

SHEETS:

Under 3/16" thick, 24" wide or over, are produced in six standard finishes.

No. 1—Hot rolled annealed and pickled (usually used for high temperature or industrial applications where processing will involve annealing or where surface appearance is not a factor).

No. 2D—Full finished (Dull cold rolled) This is generally the best finish for drawing and cold working because it holds lubricants and has best ductility.

No. 2B—Full finished (Bright cold rolled) Somewhat brighter than 2D, but not as high a luster as a polished finish. An excellent finish for subsequent polishing after shallow forming or other cold work lighter than done with 2D finish materials.

No. 4—Polished. This is the most used polished finish. It is bright but not extremely reflective and shows finger marks less than other finishes. It matches other materials well. It can be obtained on one or both sides. Is not harmed if properly protected in brake or shallow drawing or stamping operations.

No. 6—Polished tampico brushed—This is a number 4 finish brushed with tampico fiber. The finish is conservative soft and of low reflectivity. It is more uniform than the number 2 finishes.

No. 7—High luster polish—This is a highly buffed finish of high luster, the highest normally furnished. (A number 8 or mirror finish is available on special order.)

Conditions and tempers

Chromium-nickel high tensile sheets can be had in 1/4 hard, 1/2 hard, 3/4 hard, and full hard temper.

STRIP

Under 3/16" thick and 24" wide is produced in coils or can be obtained in cut lengths. Cold rolled strip is produced in the following edges and finishes:

Edges:

No. 1—A round or square rolled edge.
No. 3—An edge produced by slitting
No. 5—A square edge made by rolling or filing after slitting.

Finishes:

No. 1—Cold rolled, annealed and pickled. Similar in uses to Sheet 2D finish.
No. 2—Cold rolled, annealed, pickled and rerolled. Similar in use to Sheet 2B finish.

Conditions and tempers

Colled rolled strip in types 410, 414, 416, 420, 431, 440A and 502 can be had in the hardened and tempered condition. Chromium-nickel high tensile strip can be had in the tempers that sheet can be. Strip in cut lengths can be produced stretcher-leveled when specified.

WIRE

Stainless steel wire is available as a coiled product or in variable lengths called cut wire. It can be had as **round** wire or **shape** wire when the contour is half-round, half-oval, square, rectangular, hexagonal, octagonal, triangular, etc. Round wire is available in sizes ranging from 0.003"-0.500" while shape wire can be had in the 0.044"-0.500" range.

Wire Designation

Coarse round
Fine round
Hard drawn
Shape

For special end uses:

Free Machining Stock—automatic screw machines.

Cold Heading Wire—Commonly type 302 or 304.

Rope Wire—types 302 and 304 for stranding.

Weaving Wire—for screens, belts, wire cloths.

Armature Binding Wire—Types 302 and 304.

Slide Forming Wire—Can be had in tempers suitable for forming into numerous shapes.

Fig. 1. The plant in the center of the picture has suffered damage due to compaction of the fill beneath it. Note dash-dot line at top of building indicating original roof line. Plant was built over a filled-in clay pit; this subsequently settled

Subsurface Investigation— Insurance Against Plant Damage

Exact knowledge of the soil on your building site and its characteristics are important to your foundation problems . . . Procedures for gathering soil data . . . Analyzing them . . . Classification of soils for engineering purposes . . . Heavy press foundations present problems, too

By JOHN P. GNAEDINGER, Soil Testing Services, Inc., Chicago

IN MODERN INDUSTRY, "automation" has become the magic key word to express all that is expected of the push-button factory of the future. Yet, automation is only one phase of the completely engineered plant. And, barring unforeseen developments, the factory of 1954, 1964, or 1994 will rest on the earth, just as did the structures which housed man's earliest machines.

No modern-day building can be considered completely engineered if the characteristics of the soil on which it is to rest have not been analyzed. After all, no structure can be stronger than the soil which supports it. This simple truth has been demonstrated again and again by settlements of buildings, cracking of pavements, and failures of dams and levees with a cost to industry and the nation of millions of dollars.

Accurate soils data make it possible for the engineer to design the foundation precisely to the requirements of the construction site. Minimum safety factors can be specified because of more exact knowledge of the soil and its characteristics, while the danger of excessive settlements or failures is eliminated by proper interpretation of the boring and test data.

Predictions of the behavior of the underlying deposits are made from the evaluation of the samples and test results. These include determinations of strength, susceptibility to volume change under load and the resistance to the flow of water. All of these factors influence the final design. Failure to study soil conditions adequately, before foundation construction, represents a definite gamble. While the odds are with the gambler, the loser will find the cost dangerously high. In almost every case, exploration of underlying strata will insure satisfactory performance of the structure.

Once the primary phase of a construction program, the site survey (which furnishes location, elevation and general surface characteristics) has been completed, a preliminary subsurface investigation can be made to

determine general conditions. There is no set pattern for this work. Flexibility is necessary as each individual project requires a specialized program, determined by the type and size of the project, and available data from other sources.

A detailed study of the subsoil at a construction site requires the accumulation of certain definite information. A logical procedure has been established for the gathering of these data:

First, the nature and extent of the soil strata at the site must be determined by soil borings. The number, depth, type and location of borings for a particular project will depend on certain factors. These are: the type of structure and its cost, the area covered by the structure, the degree of variation in soil conditions over the area of construction, and the foundation problems inherent in the structure and in the soils encountered.

No single type of sampling can be used for *all* soil conditions. Also, adjustments must be made in the boring program as it proceeds to reflect soil conditions as they are determined. Ground water observations must be made and noted on logs.

Laboratory Testing

Second, physical properties of the soil strata must be determined by laboratory testing. The testing program will depend on the type of structure and the soil conditions. Tests such as permeability, compressibility, unconfined compressive strength, triaxial shear characteristics, and compaction tests are performed to suit job requirements.

Third, probable behavior of the structure is predicted after an analysis of soil data in terms of the problems inherent in the structure. This analysis will consider settlement and bearing capacity for buildings; frost action, deflection, and drainage for pavements; percolation, settlement, slope stability, and uplift pressures for dams; and slope angles and compaction characteristics for cuts and embankments.

Final step is preparation of construction drawings and specifications, which sometimes includes specifying of methods and scheduling of construction as well as materials and dimensions.

It is not only useless but actually misleading to try to utilize inadequate soil data in design. Wash samples and auger samples, for example, are of extremely limited value and great care must be exercised in attempting to use data gathered by these methods in designing a foundation. Changes in moisture content inherent in these methods will alter the properties of the soil very radically. To arrive at a sound design, it is of prime importance that soil samples obtained in the boring be undisturbed and representative of the soil in its natural state. Often it is necessary to employ special techniques to obtain suitable samples.

Soil borings can be of great value to the contractor, as well as to the plant engineer or architect. They will permit him to plan construction procedures more precisely (for example in tunneling) and give the client a more representative bid on the project.

Techniques of Testing Soils

Having presented the over-all purpose of soil investigation, we can proceed to a discussion of sampling and testing methods. This will logically lead to specific case-histories of subsurface investigation and engineering recommendations.

Early sampling was accomplished from a man-sized, hand dug open pit. In recent years, this method has evolved to the use of drills which sink comparatively small diameter holes to great depths and remove practically undisturbed samples, a process requiring skilled drillers and not merely pipe pushers. Soil strata may be investigated by recording the amount and degree of resistance to the passage of an electric current, or by the newest method of field density determination by use of radioactive materials.

For over-all completeness of a soil investigation, the laboratory with its consolidation, unconfined compression, and triaxial compression testing equipment is final word in determinations.

Test pit sampling is generally the most accurate method of sampling soils, though its cost may be excessive, especially for deep pits. It is possible in test pits not only to see the soil at its natural moisture content, but also to observe the stratification in the soil. This information is useful for correlating soil data from various portions of the structure.

The most widely used and satisfactory method of sampling incorporates drilling equipment and thin or thick walled sampling tubes. A small diameter hole is drilled to the upper sampling elevation by rotary drilling equipment, chopping bits, or clean-out augers. Any method that provides a reasonably clean hole prior to the placement of the sampling tube at the bottom of the boring is satisfactory.

Tube Sampling Technique

Special precautions must be taken to keep the hole open by the use of drilling mud or casing. Under no circumstances should the casing precede the sampling in the drill hole. Moreover, where sand or silt is being sampled special precautions must be taken to prevent a quick effect if the water in the drill hole drops below the local ground water table.

After the drilled hole is cleaned to the proper elevation, a sampling tube is inserted into the hole and either pushed or driven into the soil. The tube is then removed from the hole, and the sample within the tube is either classified and placed in a jar

Fig. 2. Drill rig ready to begin a test boring for subsurface investigation. Samples taken in field are carried to the laboratory for further study by technicians

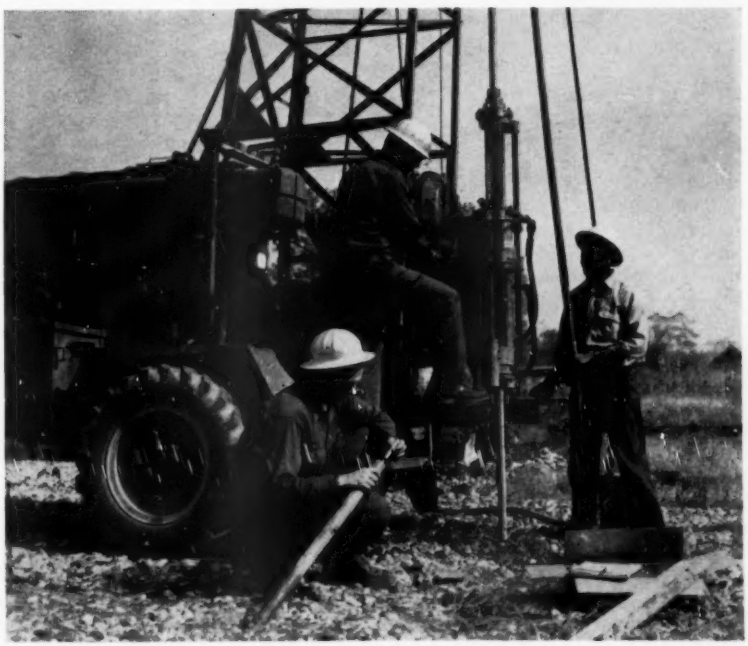


Fig. 3. Unconfined compression strength of a cohesive soil is determined by a controlled rate of strain apparatus in which stress and strain readings are taken at prescribed intervals

Fig. 4. Angle of friction in non-cohesive sands and silts is determined by this triaxial compression test. Still another instrument subjects soils to consolidation tests

at the job site or the tube is sealed and shipped to a laboratory for further tests.

Two methods most widely used in the United States are the split spoon and thin-wall tube. The split spoon method requires a thick walled steel tube which is split and then rejoined by a coupling at each end, and driven into the soil by successive blows from a hammer dropped a given distance. The number of blows required to drive the spoon is recorded on the log. The spoon is then brought to the surface, the sample removed, classified and placed in a glass jar.

Other Methods

Thin-wall tube sampling has been found to give the least disturbed samples (most suitable for testing). Here the hole is opened and cleaned as in the split spoon method, but a thin-wall tube with a diameter from 2 to 5 in. is attached to the end of the drill rod and lowered to the bottom of the boring. The tube is then pushed into the soil by a hydraulic piston arrangement, with a rapid and continuous motion.

When the tube is brought to the surface it is sealed and sent to the laboratory, as mentioned. This method has been found most useful in sampling clays and silts, since the sample can be shipped to a laboratory and the density of a silt or the consistency of a clay determined. Split spoon sampling is usually employed in sands and gravels to obtain a relative density of the material by counting the number of blows required to drive the sampling tube down one foot.

Use of auger equipment presents several serious problems. Samples obtained are never in an undisturbed state. It is impossible to auger through sand below the water table without the use of casing or drilling mud, thereby rendering the method often more expensive than the so-called undisturbed sampling method.

Penetration through large gravel in boulder strata, through hardpan, and, of course, bedrock is almost impossible with auger equipment. Removal of samples from below the water table prevents reasonable identification of the material as it exists in its natural moisture content in the soil. Thus, because of these difficulties, auger samples are, at best, a poor substitute for tube samples, and are to be used only as the economics of the situation dictate.

Probably the most important single place in which auger sampling is justified is in obtaining samples of borrow material for compacted fills. Here the natural state of the soil is not critical and only the natural moisture content must be preserved.

Soil, as engineering material, is comprised of mineral grains, dissolved salts, water, and air. Soils differ in identity primarily in the nature of the mineral grains and dissolved salts, since the water and air are virtually uniform in all soils.

A soil is generally identified in terms of grain size characteristics, color, mineral content, and properties of the mineral grains (occasionally the origin of a soil is included). The identification of a soil, however, does not reflect its probable behavior under exterior forces.

Systems used to describe soils in terms of engineering properties are called classification systems. A typical system would identify the soil and then classify it according to strength characteristics, which are of prime importance in utilizing soil boring data in designing a safe and economical foundation.

Foundation Problems

Everyday foundation problems involved in the design of one-story plant construction include: Bearing capacity of the spread footings; probable settlement of the completed structure; and the placement of compacted fill and removal of top soil to prevent cracking of the floor slab.

For structures of this type, soil borings of the split spoon and thin-wall tube method are usually employed. Borings should be carried to not less

(Continued on page 216)

Portable Hack Saws Work in Any Position

ANY JOB THAT requires hack saw work generally results in a great deal of wasted effort—especially maintenance jobs at off-the-floor locations. Sawing by hand, while standing on a step-ladder, is an awkward, inaccurate and time-consuming job.

Nothing points up the disadvantages of sawing by hand than the uses to which a portable power hack saw can be put. Portable power hack saws not only saw thin-section material such as rolled forms, structural shapes, tubing, pipe, conduit or cable but also cut spacers, bushing, bar stock, heavy tubing and angle iron. More versatile than larger stationary power hack saws, they can be carried to the job.

The Hand-I-Hack is a representative example of this new type of tool. Weighing 48 lb, the saw cuts in any position metal, plastic or fibre stock of 3-inches or less diameter at any angle from 45 to 90 deg. The saw blade draw cuts and then lifts on its return stroke, eliminating the necessity for weights. This action enables the saw to be operated vertica'ly, horizontally —even upside down. With its work vise clamped to a stanchion or a pipe, the saw is self-supporting, ready to cut within a tolerance of 0.010-in.

If you want more information, simply write The Editor, Plant Engineering, 110 South Dearborn St., Chicago 3, Ill., or indicate "Hand-I-Hack" on the postage-paid cards in this issue.

Fig. 1. At the workbench. While electrician installs fuses in the disconnect switch box, the portable power hack saw in the foreground shears off a length of conduit. The saw's operation is fully automatic, cuts in any position

Fig. 2. Off the floor. The saw's vise, semi-steel machine type with sliding jaw, is adjustable for cutting up to 45 deg

Fig. 3. On the floor. Here, worker completes one job while saw begins another. Pressure is regulated by knurled screw

BEFORE

Some of the success enjoyed by Lyon Metal in cutting indirect production costs can be attributed to its plant-wide facelifting operation. Picture on this page shows same portion of plant as next page, but before modernization

AFTER

Complete renovation and modernization program has put production equipment on production floors and non-production equipment in non-production areas. Through rearrangement, trucking has been reduced by 300 ft on some items

Analyzing Indirect Production Costs

By B. SKAGGS, Lyon Metal Products, Inc., Aurora, Ill.

RECOGNIZING THAT the control of all operating costs, and expense of all indirect production costs, constitutes a most important phase of operational economy, Management at Lyon Metal Products, Inc., Aurora, Ill., established a Production Budget and Cost Control function. By so doing Management provided assistance for plant supervision in the analysis of production cost problems and recommendations for solution.

Conducting Analysis

Observation in Plant—Initial appraisal of the scope of this function indicated that actual "on-the-spot" observation of plant operations would play a very important part. A study of historical records and routine budget cost and financial reports helped to establish the general pattern of existing operational cost problems.

Proceeding on the premise that "a stitch in time" is as fundamental in cost control as in any other area of endeavor, the hot spots were highlighted and placed high on the agenda for prompt action.

With the more important immediate targets established, a procedure for on-the-spot observations by the Budget and Cost Control Supervisor was set up. Inasmuch as a large percentage of the operations in our plant are covered by piece work or incentive rates, time data is accumulated throughout the plant by timekeepers. The timekeeping booths are located throughout the plant strategically and provide good observation posts and the close liaison between the Cost Control Supervisor and the various timekeepers provides a series of listening posts as well.

Since all cost data, including direct labor and indirect labor of all kinds, are accumulated on timecards throughout each day, a round of all timebooths at least twice a day and often more frequently gives a picture of the make-up of operation time and costs in process and often confirms visual observation of various operations.

While generally speaking, the "bad actors" are variable, especially over a period of time, it has stabilized a certain group as targets for consistent attack.

Indirect production costs which have been set up as targets for constant attack are: plant trucking; idle time —(down time); reoperation labor—(rework); piece-work fall-down—(failure to equal standard).

Observation by the Cost Control Supervisor of individuals or groups of individuals obviously idle, confirmed by the timecard of the individuals or crew involved, determines the reason for the idleness or downtime so that proper steps can be taken to correct the situation if possible or accumulates valuable information directed at an ultimate solution of the problem.

For example, all down-time is broken down into several categories used by the timekeepers to indicate that an individual or group of individuals are idle because of such things as (1) power failure, (2) machine breakdown, (3) delay waiting for necessary materials, skids, etc. (4) transfer of employee(s) from one department to another, etc.

Three Steps for Supervisor

If, for example, a crew such as our shelf line consisting of eleven people is observed to be idle and a confirmation of this downtime by the timekeeper indicates that there is a machine breakdown, the Cost Control Supervisor can take the following steps.

1. Check to be sure supervision is aware of the breakdown, (these sometimes happen while Supervisors are in a meeting).

2. That repairs have been started or if the repairs will require a long period of time that the supervisor takes action to transfer his people to other jobs, either in the department or out of the department until necessary repairs have been made.

3. Makes note of such downtime and the cause for a check against the monthly downtime report as a total to recommend over-all corrective measures in the case of repeated trouble.

An actual example of this is re-

Reasons for instituting analysis . . . Method of conducting analysis included observation in plant, study of production slowdowns, and study of maintenance records . . . Method of record keeping . . . Interpretation of findings . . . Corrective measures . . . . Results to date

flected in several breakdowns of the welder on our shelf line. Over a period of several months there were periods of downtime resulting from such machine breakdowns or failures and since it was not always feasible to transfer all or a major part of the crew to other jobs for periods of time ranging up to an hour, the cost of idle time accumulated considerably.

Based on the total amount of expense resulting from such breakdowns and a projected figure for the year it was recommended that the machine be thoroughly overhauled at the earliest possible time, since the elimination or minimizing of downtime would amortize the cost of necessary repairs. The important gain in such action, of course, being that of production hours since there is a definite loss of production during such downtime in addition to the cost of downtime itself.

This same general procedure holds true in determining production bottlenecks or slowdowns in the making due to delays in the delivery of necessary raw material or parts to various departments. A check of timecards in any given department which shows that several people are idle waiting for material will precipitate the same general chain of events leading to a determination of the reason for the delay and prompt corrective action where possible.

The same approach often indicates a temporary lack of necessary manpower possibly resulting from absenteeism which is causing a production delay. This also is indicated in an established category of downtime and when called to the attention of a supervisor brings action to effect the transfer of required manpower from other departments which may have a temporary surplus of help.

Furthermore, the same method of observation and checking on the other principal targets of indirect cost control such as trucking, reoperation labor and piece-work falldown brings out into the open the existence of such immediate problems on an hour-by-hour basis throughout each day. During paperwork periods in the office, the Cost Control Supervisor is kept in touch with the situation and any developing hot spots by the timekeepers, time study men and supervisors. Upon such advice from the plant the Cost Control Supervisor checks in the matter.

Causes of Slowdowns

Study of Production Slowdowns—A study of production slowdowns through these same on-the-spot observation and record trends finds its targets also to be largely those indicated previously, i.e. down time, reoperation labor and piece-work fall-down. The prevalence and extent of reoperation labor indicates the level of rejections, damage in process and is a barometer of quality, in various lines of products.

Obviously any extensive amount of reoperation labor means fewer production hours and cannot help but curtail productive output. As indicated previously, downtime, for any of the many existing reasons, also represents a slowdown in production through the loss of productive hours.

Piece-Work Problems

Although piece-work fall-downs (failure to equal standard) have not been touched upon heretofore, inherent in such fall downs is the same production slowdown and loss of productive hours. The various contributory factors involved in piece-work falldown cover many angles. For example, there is the usual bucking of a piece work rate considered by the employee to be "tight" or otherwise unfair.

Conversely, there is the fall-down which is the result of piece work rate which is actually too tight or otherwise unfair to the employee. There is the fall-down which results from the inept efforts of an inexperienced employee, from defects in the material or part, from a design or engineering failure. Piece-work fall-downs for any of the above reasons have the same end result, that of slowing down production.

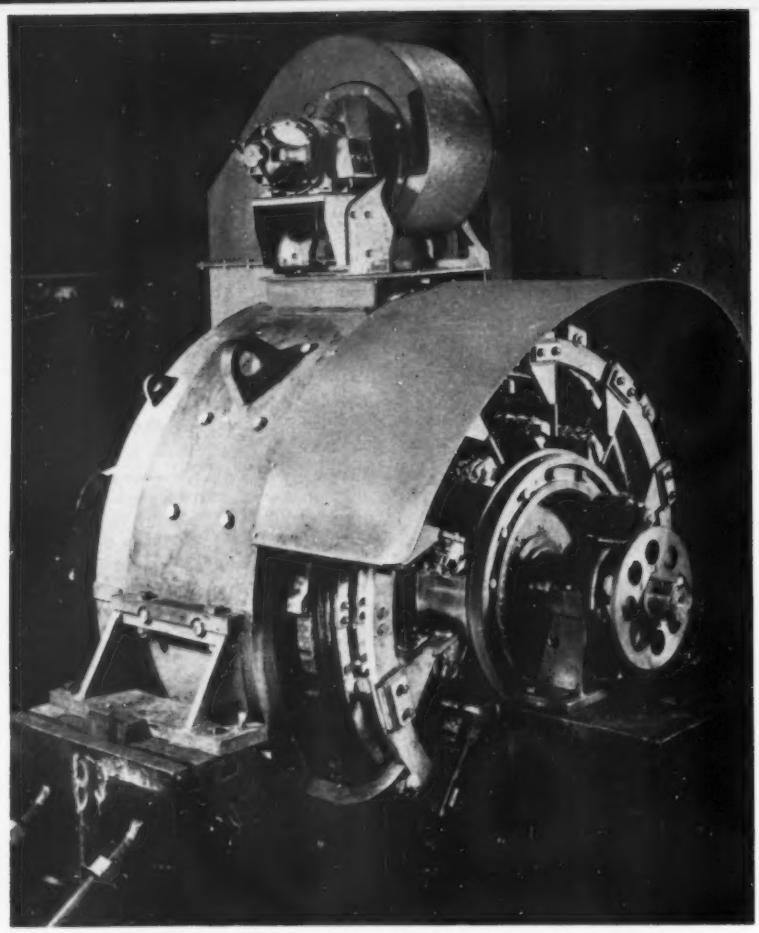
Analysis of slowdowns resulting from the causes listed above frequently brings about recommendations for corrective measures through prompt action or research and investigation where such is necessary.

Records of data in many different phases of operations contribute to the efforts of the cost control function. These records on a daily basis stem largely from the Timekeeping Division which provides access to the actual timecards themselves, also daily piecework, day-work hour records by individual employee, daily records of excess costs charged into operating schedules or against specific orders, such excess costs attributable to off standard methods, cost of additional operation, or cost of day work versus piece work.

Also on a daily basis from the timekeeping division come charge-back reports which indicate reoperation labor showing the order, schedules and pieces involved, the reason for the rework, the time and money involved. Piecework fall down records are available for each day on about every second day.

On a monthly basis the Financial Division of the company provides a detailed report of performances against operating budgets, a detailed report of downtime, and a detailed report of

(Continued on page 202)



Vibration in this fan assembly was noted when the machine was running on the test floor. Two horizontal and two vertical readings with a sine wave generator were taken to determine corrective measures. See Fig. 8 and the text

Investigation and Elimination of

Vibration in Electrical Machines

This is the second part of the two part article . . . Methods of determining unbalance and apparatus used . . . Correct placing of weights . . . Plotting of readings . . . Dynetric balancing machines . . . Use of the sine wave generator . . . Use of the Reed Vibrometer and the Vibrograph

By V. G. SOROKIN, Transportation and Generator Division, Westinghouse Electric Corp.

WHEN THE ROTOR of a machine is an elongated body, a system that is balanced statically can be dynamically unbalanced. The pedals and shaft of a bicycle are statically balanced but when rotation starts, the centrifugal force of the pedals will produce the unbalance.

An elongated rigid rotor can be balanced by two correction planes, usually put in the end plates of rotor where special taps are provided. When balancing high-speed long flexible rotors of turbo generators, three or more balancing planes are used and procedure is more complicated.

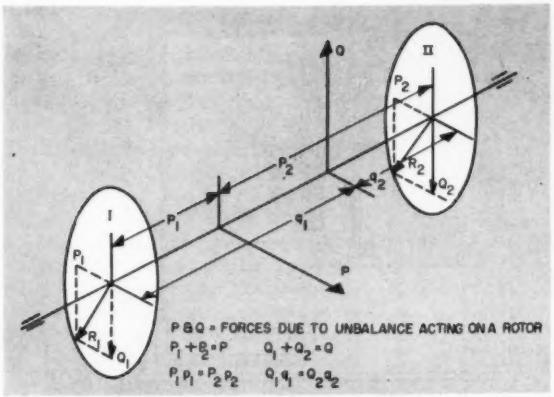
The forces of unbalanced weights acting on the rotor and the forces produced by correction weights placed in end-plates of rotor are shown in Fig 5. Force R_1 is the sum of P_1 and Q_1, and force R_2 is the sum of P_2 and Q_2. Thus, balance weights equal to R_1 and R_2 will balance the rotor. The problem of balancing is to find the magnitude and the position of correction weights R_1 and R_2.

Before deciding that the machine vibrates due to unbalance, it is advisable to check first all causes mentioned in the first and second group of vibration causes which appeared in Part I[1].

The state of unbalance of rotor may be checked by running machine uncoupled or without belts clamped down solid. To check whether unbalance is introduced by couplings or pulleys, run machine without them. When it is found that vibration is due to unbalance in rotor it will be advisable to call an experienced balancer from the factory to rebalance the rotor.

In the following, a brief description is given of methods and apparatus used by balancers to place the correction weights properly. The arrangement of apparatus is shown in Fig. 6.

[1] April issue of Plant Engineering, page 86.



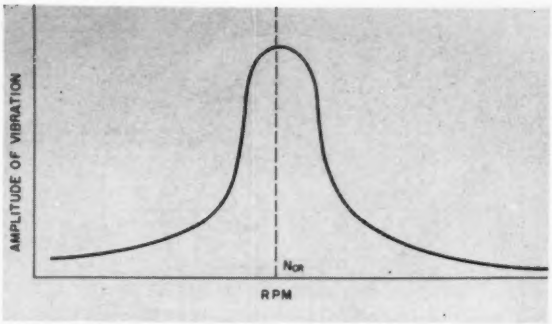


Fig. 5. Left: Vector forces due to unbalance working on the rotor. Fig. 7. Above: A resonance curve for a typical rotor

The output of the sine wave generated is fed into the current coil of wattmeter. The amplified output of the electric pick-up is fed into the voltage coil. Wattmeter reading is proportional to the product of the voltage amplitudes of the same frequencies in its coils multiplied by the cosine of the angle between them. The output of the sine wave generator is the sine wave of running frequency so the vibrations of all other frequencies delivered by the electrical pick-up are filtered out.

Sine wave generator has a rotor consisting of a two-pole permanent magnet, and is usually directly coupled to the rotor of the machine. (In case of double frequency investigations, one to two gearing is introduced.) The stator has two windings which are identical except for being 90 deg apart. One or the other winding can be switched on. Stator can be rotated by hand to vary the phase angle of the voltage generated. A protractor is attached to the stator to read its angular position.

By changing the angular position of the stator the voltage from it and from the pick-up can be brought into or out of phase. Correspondingly, the wattmeter will indicate the maximum or zero deflection. The position of stator for the zero reading indicates the phase of the pick-up voltage and of the vibrating motion. By switching to the second winding of the generator (90 deg apart) the maximum reading is obtained that will indicate the amplitude of the vibration.

Readings can be plotted as vectors and the problems of balancing can be solved either by vector analysis or trial-and-error vector manipulation. Two plane balancing problems generally are solved using either the analytical method or the trial-and-error method. In three plane balancing problems, the trial-and-error method is more often used.

It is best to balance large rotors at the running speed of the machine. This is particularly true with high speed rotors of appreciable length which may be affected by a change in shape due to centrifugal force of the coils, fans, etc.

In some cases such as turbine-driven generators, unbalance at full load is due to heat distortion of the rotor. However, it is not always necessary to run rotor at the rated speed for balancing. In many cases, balancing can be done at lower speed if there are sufficiently sensitive instruments for measurements.

Dynetric Balancer

For smaller, shorter and more rigid motors the better production method is to balance them on a slow speed dynetric balancing machine. Rotors of motors and generators as large as 25,000 lb, with certain exceptions, are successfully balanced on such machines.

Dynetric balancing machines, as used on test floors, are run at constant speed, approximately 500 to 800 rpm. Small rigid rotors with operating speeds up to 2500 rpm are balanced on these machines without additional balance test of assembled machine. Large flexible rotors, however, must be checked at the running speed. No general rule can be given regarding limits in rpm or in size of machine up to which balancing speed will be satisfactory. Size of rotor, length and flexibility of rotor are important.

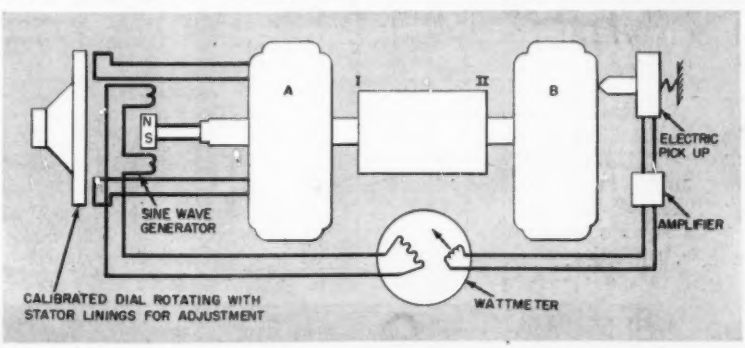
Balancing of small, short rotors up to approximately 25 in. diameter at low sped in dynetric balancing machines is found satisfactory for high speed rotors. Generally it can be considered a standard practice to balance short, small rigid rotors of rated speed up to 1800 rpm at approximately 600 to 800 rpm.

Long, large rotors, sufficiently flexible to have the shape affected when running at higher speeds, should be balanced at rated speed. For those rotors, the limit would be approximately 1000 rpm up to which speed balancing on dynetric machine would be satisfactory without additional checking at the rated speed.

Limits of balancing test speed depend on construction of the rotor. Rigidity of parts assembled on rotor is of importance. Some parts may get shifted when rotor is brought up to higher speed and, in this case, the balancing at lower speed will prove unsatisfactory. Salient pole rotors of larger sizes when balanced at lower speeds may develop vibrations when brought up to speed due to a shift of the pole winding by the action of the centrifugal force.

If the rotor is mounted in its bear-

Fig. 6. Equipment for balancing, using sine wave generator and electrical pick-up



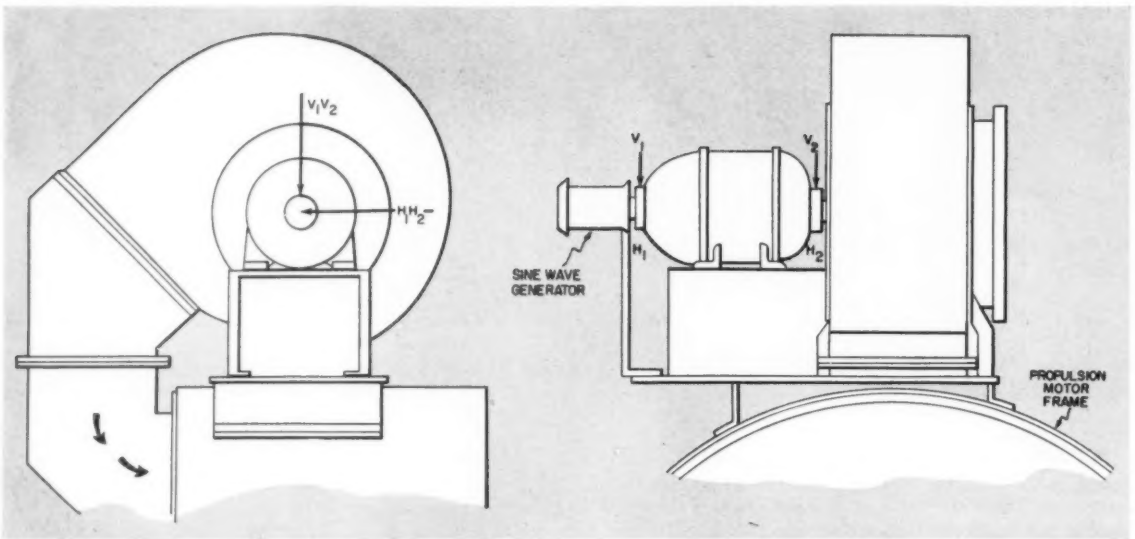


Fig. 8. Two views showing the arrangement of the motor-driven fan assembly used to ventilate a propulsion motor

ings and rotated at varying speeds, the shaft will become dynamically unstable at a certain speed and large vibrations will develop.

Plotting amplitude vs. speed, a resonance curve is obtained, Fig. 7. The speed at which the peak of vibrations is reached is called the "critical speed." The rpm at the critical speed corresponds to frequency of the natural lateral vibrations of one shaft. Natural vibrations are those that will be produced in the shaft if it receives a blow by some outside force—for example, a blow by hammer.

Frequency of the natural vibrations per minute can be found by the formula $Ncr = 187.7\sqrt{1/y}$ where y is the static deflection of the shaft. If the machine is designed so that the natural frequency of vibration of the rotor is close to the running speed, very large vibrations may develop.

To learn whether vibrations in the machine are due to resonance or to some other cause, it is necessary to run it at varied speeds and record the amplitude of the vibration at each speed. Plot the results and also obtain a resonance curve. At some speeds, the curve will show an increase of amplitudes. If this happens in the range of running speed, then the condition of resonance in the machine is proved.

In using a sine wave generator for measuring vibration, the angle changes radically as the vibrating body goes through resonance. In the ideal case of single degree of freedom system, this change is 180 deg.

The wattmeter type instrument using an electromagnetic pickup sine wave generator is used not only for placing balance weights in the rotor during the balancing procedure, but also for general analysis of vibrations of parts and machines. Readings of vibrations of rotors, stators, bedplates, and of the floor can be taken, and analysis can lead to the solution of the vibration problem.

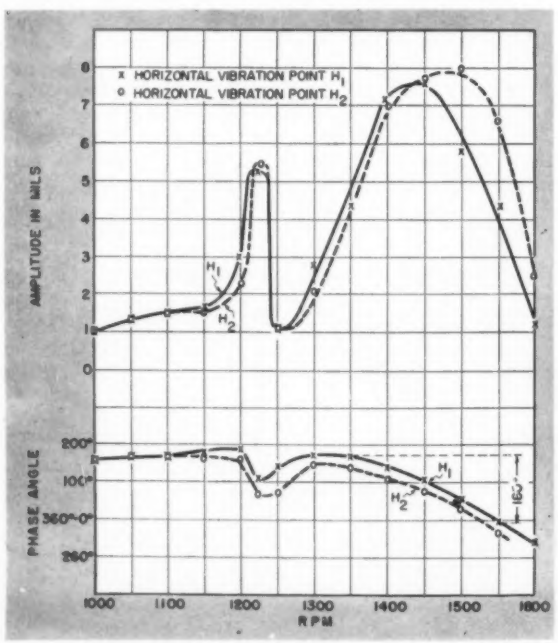
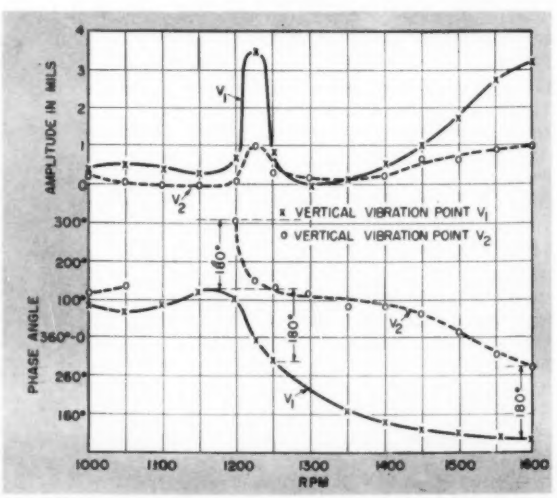


Fig. 9. Left: Amplitude and phase angle of vertical vibrations plotted against speed. Fig. 10. Below: Amplitude and phase angle of vertical vibrations plotted against speed



For example, take the case of a fan assembly vibration. A motor driven fan was used to ventilate a propulsion motor. The fan motor was rated 2½-hp, 1015/1450-rpm, and was mounted on the top of the frame of the machine so that it would blow air through the upper part of the rear end-bell. This arrangement of the fan is shown in Fig. 8.

When the machine was running on the test floor, it was noticed by rough check of the fan motor frame that it had excessive vibration. Sine wave generator readings were taken at varying speeds of the fan motor. The sine wave generator shaft was attached to the motor shaft by tapping in the end of the motor shaft. Two horizontal and two vertical readings were taken as shown by H_1, H_2 and V_1 and V_2 in Fig. 8.

The curves for horizontal and vertical vibrations were plotted from the data measured (Fig. 9 and 10). From Fig. 9, it can be seen that there are two peaks of the amplitude of vibrations. One peak is at 1225 rpm and the

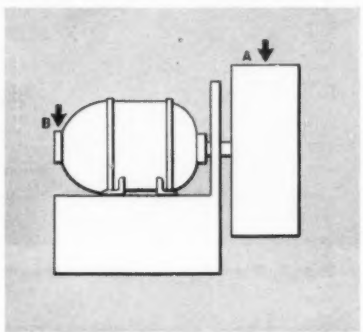


Fig. 11. Motor with support and fan rotor removed for conducting bump test

second at 1500 rpm. From phase angle readings, it is noted that horizontally both ends of the motor have approximately the same phase angle initially. This means that before resonance both ends move together in the same direction. The phase angle change at 1225 rpm, which is less than 180 deg, indicates that after resonance one end moves in a direction opposite from the other. At 1500 rpm, the phase angle changes through 180 deg and indicates a resonance point for horizontal vibrations.

From Fig. 10, it can be noticed that at 1225 rpm there is a resonance for vibrations in the vertical plane. There is a peak of amplitude for each end. The phase angle changed approximately 180 deg.

The phase angles of points V_1 and V_2 are approximately 180 deg apart above 1200 rpm. This means that when one end of the motor goes up, the other end moves down. Since the resonance points were in the range of the fan motor speed, the problem was to change spring constants of parts so that the assembly would be out of resonance. First, the fan motor shaft was checked for critical speed. Two concentrated loads were considered: first, weight of the rotor at centerline of armature; and second, overhung load of the fan impeller. An average shaft diameter was estimated. The critical speed of approximately 2850 rpm was calculated, out of range of measured peaks of amplitudes.

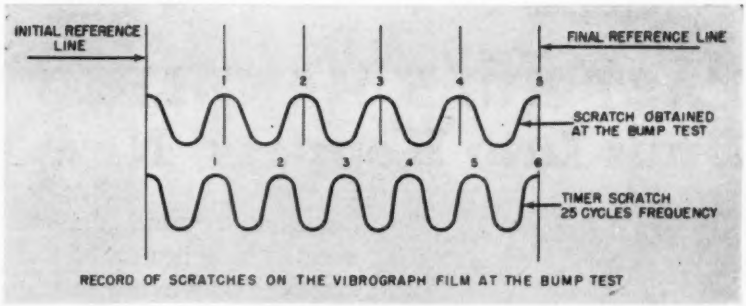


Fig. 12. This is the scratch record that results from Vibrograph bump test

Next, measurements using a sine wave generator were made along the vertical lines. Lines were taken at the centerline of the armature of the fan motor in a plane perpendicular to the shaft and in a plane through the centerline of the shaft. It was found that amplitudes diminished gradually from the motor down to the support, and low values were found at the support, indicated a nodal point of vibrations.

To make an additional check that the mounting bracket attached to the top of frame and supporting the assembly did not have influence on the natural frequencies measured, the motor with support and fan rotor were removed from the mounting bracket and placed on the firm support, as in Fig. 11.

A bump test was made using a Vibrograph. A series of light hammer blows were made at point A and recorded by Vibrograph at point B. The film obtained with scratches by the timing prong and the recording prong is shown in Fig. 12 viewed through the microscope.

Since the frequency of the timer is 25 cycles, the recorded frequency is:

$$\frac{25 \times 60 \times 5}{6} = 1250 \text{ rpm},$$

which corresponds closely to resonance peak, Fig. 10.

There are two courses that can be followed to get the assembly out of resonance. The assembly can be reinforced, raising the frequency of the natural or free vibrations of the system, or the supports can be made more flexible, lowering the frequency of the natural vibrations. In this case, it was decided to reinforce the motor support. Steel plates were welded to the support to reinforce it in the two directions. After parts were assembled and tested no objectionable vibrations were present in the fan assembly.

Oscillator. An oscillator or shaker is used to produce a periodic force for determining the resonant frequencies and modes of vibrations of structures. It consists of two discs rotating in a vertical plane. The discs have a number of holes along their periphery for mounting the unbalance weights. The shaker can be assembled on the part of the machine that has to be investigated. The discs are driven by the separately mounted motor, usually by means of a long slender shaft. The amount of unbalance in the shaker can be changed to produce the force to suit conditions. The motor is run at varying speeds and sine wave generator readings are taken at the points of the structure.

Torsional Resonance. If the frequency of external torque corresponds to the frequency of the natural torsional vibration of rotor, a condition of torsional resonance takes place. A resonance curve can be plotted similar to a curve for laterial vibrations, except that for abscissas, the frequency of the outside torque, and for the ordinates, the angle of twist of shaft are used.

Instruments. For measurement of vibrations, there are many varied types of instruments. The Reed Vibrometer for measuring the frequency of lateral vibrations consists of a strip of steel which can be extended by rotating two wheels that clamp the strip at the point where it extends from the handle. The handle has a pointer and calibrated scale on which the frequency of the vibration can be read. This instrument is similar in principle to the widely used Frahm Tachometer.

The Vibrograph, developed by Westinghouse Research Laboratories, records vibrations on celluloid film. It has a movable scriber attached to a

(Continued on page 208)

FAST BULK HANDLING Built Into Koppers' New Plant

Designed around the plant's chief product, coal tar enamel, this handling system consists of two practically identical conveying, storage and weighing systems. Both of these systems lead to a common mixing system

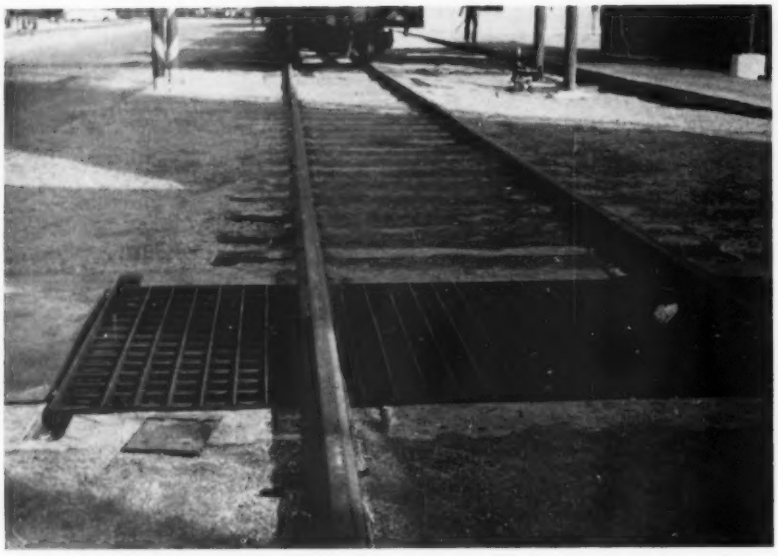


Fig. 1. Grated dump for gondola cars. Beneath grating is a motorized conveyor

Fig. 2. View of the bucket conveyor

WHEN KOPPERS COMPANY, Inc. (Tar Products Division), dedicated its first west coast plant at Fontana, Calif., Feb. 5, it unveiled a compact operating unit—incorporating probably the most efficient materials handling design in tar products manufacture.

Designed Around Product

Koppers' installation, growing up adjacent to the expanding industrial orbit whose vortex is Kaiser Steel Corp., will process crude tar to make creosote, coal-tar enamels used to protect pipe-lines, pitches for roofing, and a number of kindred products, among them carbon electrodes, foundry cores and fibre conduits.

The plant's materials handling system is designed around its chief product—coal-tar enamels. Crude-tar, by-product of chemical-coke reduction processes at Kaiser, is piped to the neighboring Koppers plant at 175-200 F, via a 6-in. line. At Koppers, four storage tanks—totalling 1,500,000 gal—receive the ingredient.

The handling novelty, however, is concerned with receipt and disposition of two coal-tar enamel dry ingredients—coal and talc. In the past, tar products plants have received dry materials by various methods, most of them requiring rather extensive employment of labor. Koppers' built-in handling system delivers both talc and coal to final mixing vats via a conveyor-hopper set-up, push-button controlled . . . a one-man operation.

The process begins when either talc or coal is received via hopper rail car or truck. Two 200-ton capacity silos—one for each material—stand side-by-side near the plant's spur. Associated with each silo is a separate 50-ton weigh hopper, each individually suspended from a beam system and scale combination. When weighed, either ingredient gravity flows into the same screw-conveyor, is carried to the final mixing vat where it meets the liquid coal-tar, now refined to pitch.

A flick of a few control buttons, strategically located, sets the materials handling system in operation—delivering the two dry materials to mixing.

Coal Handling: Coal is delivered in 50-ton hopper cars. Hoppers empty into a grating between the rails, delivering coal by gravity to a 2-ton track bin, which is continuously emptied by a 26-ft long, 24-in. wide, drag-type conveyor. Coal is unloaded at from 25-30 tons per hour. This lead-in conveyor, powered by a 5 hp motor, delivers coal to a bucket conveyor, which lifts the material to the top of a 200-ton capacity silo. This silo is constructed with a slanting chute—a kind of baffle. When the silo is filled, coal reaches the chute level and can flow by gravity into a pulverizer. Another conveyor, at the silo's bottom, returns unused coal to the bucket conveyor, thence into the silo.

Handling Pulverized Coal

Pulverized coal is next carried via an air conveyor (installed with a 20-hp blower) to a 50-ton weigh hopper, scale-and-beam suspended, and built directly over a 12-in wide screw conveyor.

From screw conveyor, the finely pulverized coal is lifted by bucket conveyor to still another screw con-

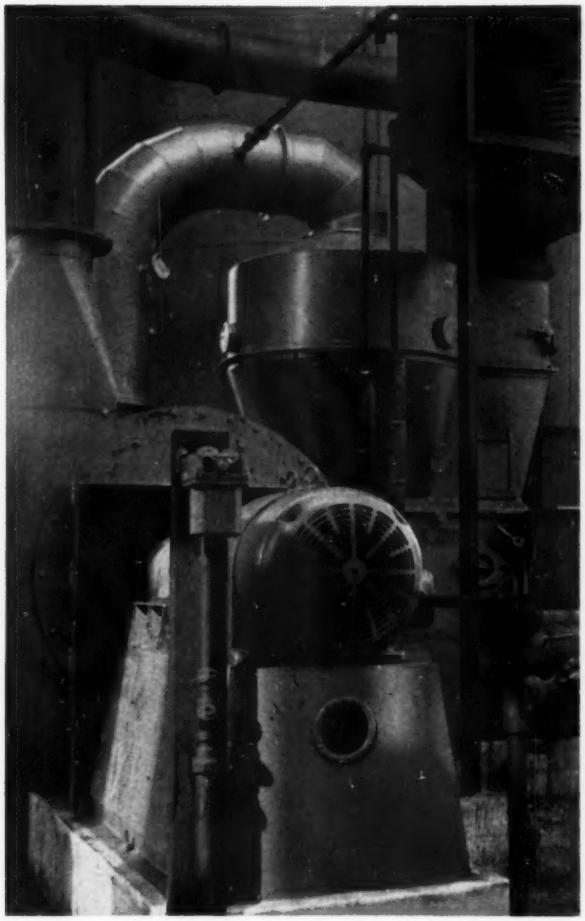


Fig. 3. Pulverizer and blower portion of dry handling

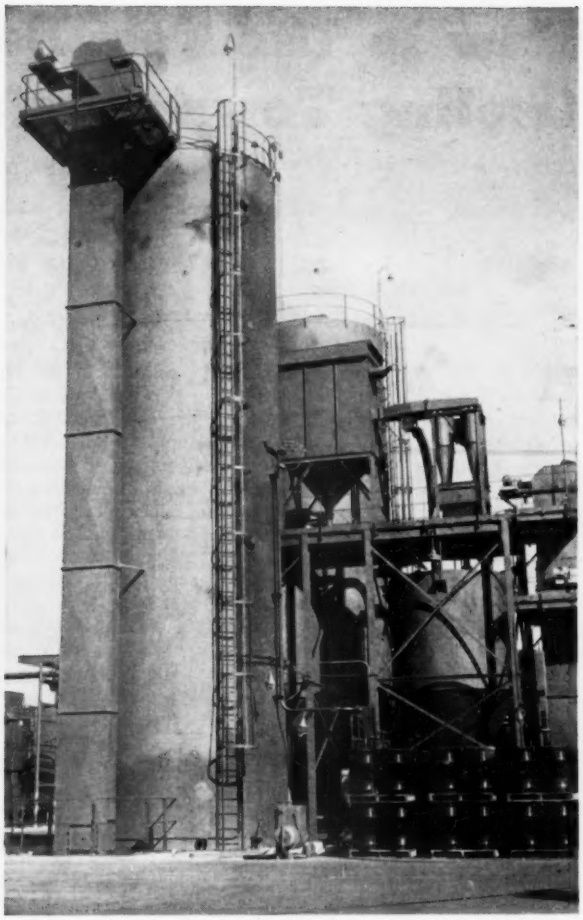


Fig. 4. View of Koppers' installation for dry materials handling

veyor, which delivers it in measured amounts to the mixing tank. This final screw unit, thus, has double function: (a) transportation; (b) delivering only enough of the material as can be readily mixed with other mixer-vat ingredients.

Fundamentally, the talc receiving system is identical.

Talc Handling: Talc, because it is already finely ground, by-passes the pulverizing unit. Usually it's received by truck. Initial delivery sees a canvas boot connected between the truck's outlet and the opening that leads to a screw conveyor. So that the screw will not be overloaded by a sudden rush of the material, a rotary-valve control is installed between boot and receiving port. The valve is synchronized with the conveyor, assuring uniform discharge.

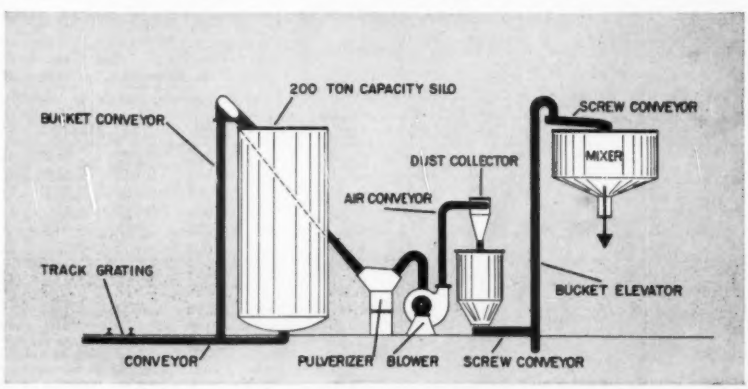
Talc, unloaded at 15-ton an hour, is likewise deposited in a bucket conveyor, carried to the top of another 200-ton capacity silo. This unit, however, may be by-passed, so that talc is delivered directly to its weigh hopper, again a 50-ton capacity, separately beam suspended, scale rigged unit.

Plant superintendent J. C. Fitzpatrick, says the push-button system for dry ingredients handling will greatly reduce labor costs. As a matter of fact, the units can operate unattended, save for the scale calculations, and tripping of a gravity flow valve which delivers the weighed ingredients, separately, into a common screw conveyor for hoisting to the mixing vats.

Although the silos and their associated conveyors are rigged to a dust control unit, the system is totally enclosed, so that the escape of the products is negligible.

Koppers Fontana plant becomes the 55th in its nationwide net, and the 23rd in company's Tar Products Div.

Fig. 5. Diagrammatic sketch of the coal-handling portion of Fontana installation



How to Use Test Data to Calculate Cooling Tower Performance

Instead of using higher mathematics to determine if your cooling tower is performing reasonably close to specified conditions, authors explain how this job can be simplified by using the test data method

By F. B. REED and L. T. MART, The Marley Co.

HERE IS A simple method of using test data for analyzing actual cooling tower operation against predicted performance.

Any means of evaluating cooling tower performance may be considered as a yardstick. This yardstick, however, is of no value until it has been calibrated by applying the method of analysis to actual test data.

The numerical factors in Table I provide a means whereby tower test data can be used to determine if the tower is performing reasonably close to specified conditions or if it is widely deficient in performance.

Checking Tower Performance

Test factors in Table II permit checking the performance of industrial towers at other than design atmospheric wet-bulb temperature. The data in each table are very general, and have been developed from calculated performance ratings of various types of wood-filled mechanical draft towers.

These factors are applicable to the test data of any such towers within design limits of 12 to 35 F cooling range, 6 to 16 F approach to wet-bulb, and for summer weather conditions of 70 to 80 F wet-bulb temperatures for reasonable accuracy.

The tabulated factors represent average water loading, as is also indicated by the broken line in Fig. 1; and accuracy will depend somewhat upon the specified capacity and design conditions of the tower being tested.

Test factors in Table I and Fig. 1 are based upon average water loading for a tower. When water quantity increases or decreases there may be slight inaccuracies in calculating tower performance. Further inaccuracy may be attributed to the inability to adjust all types of cooling towers to a common performance factor. However, as test conditions approach design requirements the accuracy will be improved, refer to Fig. 1.

Operating test conditions must be reasonably close to the original design (purchase conditions), otherwise errors will be introduced due to variation in design of the equipment. The weather, water capacity in gallons per minute, cooling range and total heat load during test should approximate conditions for which the tower was purchased with tolerance of variation being within the permissible limits (see nine items listed below) of good practice as recommended and established by the Cooling Tower Institute. Under these conditions, the data in Table I will permit analyzing test results close enough for practical purposes and to determine whether an expensive formal test, and a more detailed analysis will be justified.

Because of variance in design features of cooling towers such as principal dimensions, type, interior arrangement, distribution system, liquid-gas ratios, etc., some variations in performance will occur and therefore allowance must be made against actual test results. When the tower test is conducted within the limits established for the data in Table I, the maximum amount of error or deviation of the test analysis from specified conditions will be as shown in Table III.

Design vs. Test

Tower performance under test conditions may be measured and compared with the specified performance or capacity from the test data, Tables I and II, and the following equations:

Design Performance = Design gpm × Tower Test Factor × Wet Bulb Factor, or:

DP = gpm × TT Factor × WB Factor

Test Performance = Actual gpm × Tower Test Factor × Wet Bulb Factor, or:

TP = gpm × TT Factor × WB Factor

The departure from specifications is measured by the Performance Ratio which represents the per cent of excess tower capacity or deficiency.

$$\text{Performance Ratio} = \frac{TP}{DP}$$

When test conditions are maintained within reasonably close limits of design conditions, ie., capacity in gallons per minute, cooling range, heat load and wet bulb temperature, a performance ratio less than one indicates that the tower is deficient.

Table I. Tower test factors show calculations for per cent ratio of cooling range and approach to wet bulb temperature*

Per Cent Ratio Test Cooling Range / Design Cooling Range	Per Cent Ratio Test Approach to Wet Bulb Temperature / Design Approach to Wet Bulb Temperature												
	80	85	90	95	100	105	110	115	120	125	130	135	140
90	1.130	1.067	1.015	0.970	0.926	0.889	0.852	0.818	0.787	0.759	0.734	0.710	0.686
92	1.148	1.085	1.033	0.986	0.941	0.903	0.868	0.832	0.801	0.773	0.748	0.723	0.698
94	1.165	1.102	1.049	1.000	0.957	0.918	0.882	0.846	0.814	0.786	0.760	0.735	0.710
96	1.183	1.120	1.065	1.016	0.971	0.932	0.895	0.860	0.827	0.798	0.772	0.746	0.721
98	1.200	1.135	1.080	1.030	0.986	0.947	0.910	0.874	0.840	0.810	0.783	0.757	0.732
100	1.218	1.150	1.095	1.044	1.000	0.960	0.922	0.888	0.852	0.822	0.795	0.768	0.743
102	1.234	1.177	1.110	1.059	1.014	0.973	0.936	0.900	0.864	0.833	0.806	0.779	0.753
104	1.250	1.181	1.125	1.072	1.028	0.987	0.949	0.912	0.876	0.844	0.817	0.789	0.763
106	1.266	1.198	1.140	1.089	1.042	1.000	0.960	0.923	0.888	0.855	0.827	0.799	0.772
108	1.281	1.212	1.154	1.101	1.055	1.011	0.971	0.934	0.899	0.866	0.836	0.809	0.781
110	1.295	1.225	1.168	1.115	1.068	1.024	0.983	0.946	0.909	0.877	0.845	0.818	0.790

* See footnote under Table III

Table II. Wet bulb factors for temperature variation, and three approaches

Wet Bulb Temperature During Test	Approach (to Test Wet Bulb)		
	6 to 8 F	9 to 11 F	12 to 16 F
Design +3°	0.890	0.905	0.911
Design +2°	0.925	0.935	0.939
Design +1°	0.961	0.965	0.969
Design Temp.	1.000	1.000	1.000
Design −1°	1.040	1.037	1.034
Design −2°	1.082	1.075	1.070
Design −3°	1.124	1.115	1.109

Test conditions must be established within all of the following limits in order to provide data for reasonably close analysis of actual tower performance:

1. Gallons per minute of water, ± 10 per cent of design.
2. Cooling range, ± 10 per cent of design.
3. Range variation during test, ± 5 per cent.
4. Constant gpm during test.
5. Average wind not to exceed 7 mph.
6. Wet bulb, as limited in Table II,
7. Water solids, below 5000 ppm trend during test of 2 F.
8. Fan horsepower, as specified in contract.
9. Heat load, ± 10 per cent.

The following example will illustrate how the test data can be used to calculate cooling tower performance.

Design Conditions

Water quantity: 10,000 gpm
Hot water temperature: 105 F
Cold water temperature: 85 F (Cooling Range = 20 F)
Wet bulb temperature: 75 F (Approach = 10 F)

Test Conditions

Water quantity: 10,250 gpm
Hot water temperature: 103 F
Cold water temperature: 84.5 F (Cooling Range = 18.5 F)
Wet bulb temperature: 72 F (Approach = 12.5 F)

Taking the figures from the two conditions given above, we would get the following information:

$$\text{Test range} = \frac{18.5}{20} = 92.5 \text{ per cent}$$

of design range.

$$\text{Test approach} = \frac{12.5}{10} = 125.0 \text{ per}$$

cent of design approach.

Design performance = 10,000 gpm × 1.000 TT Factor × 1.000 WB Factor = 10,000

Test performance = 10,250 gpm × 0.776 (Table I) TT Factor × 1.109 (Table II) WB Factor = 8,821

$$\text{Performance ratio} = \frac{8821 \text{ TP}}{10000 \text{ DP}} = 0.8821$$

The tower is therefore more than 11½ per cent deficient in performance, and hence 13.4 per cent more tower capability would be required to meet specified or design performance. Referring to the last column of Table III, for test conditions in the above example, the error would not exceed 3.5 per cent.

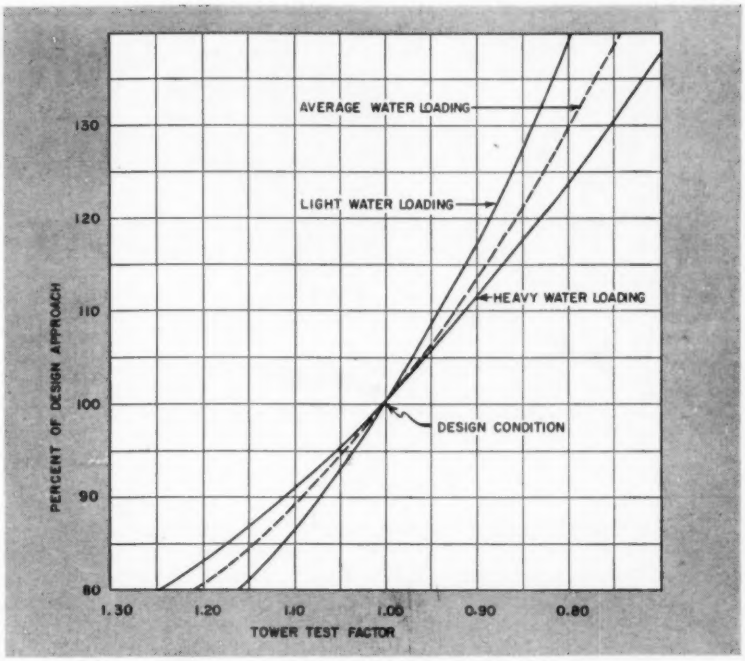


Fig. 1. The effect of water loading on the tower test factor is shown above

In order to obtain satisfactory and reliable results from the Tower Test Factors given in Tables I and II, it is necessary to obtain accurate test information on the tower. Tests should be made in accordance with the Cooling Tower Institute Test Procedure Form No. TSC-101 or the current ASME Power Test Code for "Atmospheric Water Cooling Equipment."

Before starting a test, tower operating conditions should be adjusted to approximate design conditions insofar as is practicable. Tests should be made during the daylight hours, fair weather, and with the tower in operation at test conditions for sufficient time prior to start, to assure stable conditions.

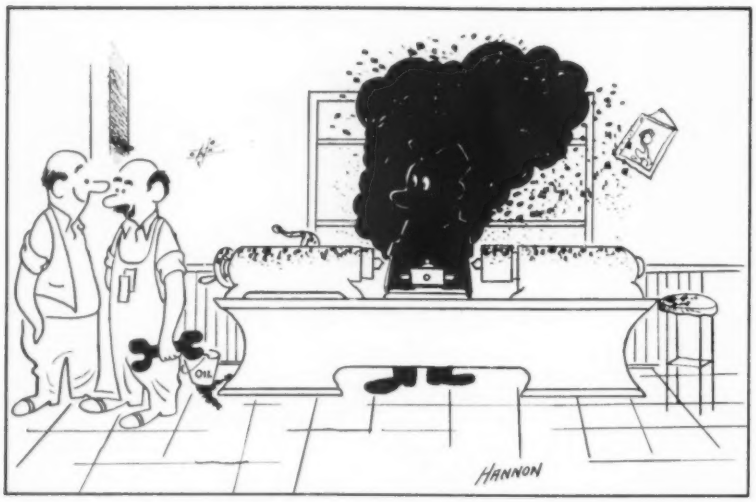
The most important data to be obtained during a tower test are the measurement of water quantity, ambient wet-bulb temperature of air entering the tower, and water temperatures to and from the tower. Other test suggestions and precautions follow.

Tower Preparations. Prior to testing, the tower should be inspected to determine that the distribution system is clean and that the flow of water is

Table III. Predicted accuracy limitations* of test factors in Tables I and II, showing maximum variation of test conditions and maximum error in design

Maximum Variation, Test vs. Design Conditions			Maximum Error in Per Cent of Tower Design Conditions		
			Range 12 — 17 F Approach 6 — 8 F	Range 12 — 17 F Approach 6 — 8 F	Range 18 — 29 F Approach 9 — 13 F
Water Capacity Gpm	Heat Load Btu	Wet Bulb Temp.	Range 18 — 29 F Approach 9 — 13 F	Range 30 — 35 F Approach 14 — 16 F	
Per Cent	Per Cent	Deg F	Per Cent	Per Cent	Per Cent
5	5	0	1.0	0.75	0.5
10	10	0	2.0	1.5	1.0
5	5	1	2.5	2.0	1.5
10	10	1	3.5	3.0	2.5
5	5	2	3.5	3.0	2.5
10	10	2	4.5	4.0	3.5
5	5	3	4.5	4.0	3.5
10	10	3	5.5	5.0	4.5

* A table similar to Table I can be developed from calculated performance ratings for each individual type or make of cooling tower based upon design water loading and design temperature conditions. The accuracy of this data would be entirely within the limits of good practice and test analysis, thus eliminating the accuracy limitations given in the above table.



"Didn't anyone tell the new guy about the 5:15 freight?"

equally distributed over the tower cells. The wood splash bars should be free of algae and other foreign materials. Fan horsepower should be checked for agreement with contract requirements. Eliminators and air inlet louvers should be in original condition so as to permit even and uniform air distribution through the tower.

Water Flow and Temperature

Water Measurement. The water flowing to the cooling tower may be measured by any one of the various methods approved by ASME power test codes. These may include a pitot tube traverse, a venturi meter installation, or the use of an orifice plate. The pitot tube provides an easy method of measurement since it can be equipped with packing glands and inserted through a small gate valve. The tube connections or valve should be installed in a line as far as possible from any fittings or turns. Guarantees are based upon water flow to the tower, so that blow-down and the addition of make-up water during test should be avoided.

Water Temperature Measurements. (a) Hot Water: The hot water temperatures should be measured as near the tower inlet as possible by either direct contact or from thermometer wells. Hot water temperature is usually uniform and free from rapid fluctuations. However, careful checks should be made to determine if stratification of water exists.

(b) Cold Water: Stratification is frequently present in the cold-water collecting basin, hence thorough mixing of the water ahead of the point of measurement is necessary to assure accurate temperature readings. If the circulating pump is located near the tower, temperatures may be measured at the pump discharge since the pump usually provides adequate mixing of the water. The heat added by the pump is normally negligible. Standard mercury-filled thermometers graduated in 1/5 F are preferable.

Wet-Bulb Temperature Measurement. Wet-bulb temperature of the air should be measured on opposite sides of the tower at the air inlet and at a point not more than six feet above basin curb and within 10 ft of the air inlets. Temperature readings should be taken at a minimum of three points on each side of the tower. Wet-bulb temperatures are measured by a sling psychrometer using water from the tower to wet the thermometer bulb.

When the performance guarantee is based upon the average wet-bulb temperature of the ambient air, a single location for readings is sufficient if the surrounding area has no equipment which would affect the wet-bulb temperature. The readings should be made on the windward side of the tower, approximately five feet above the ground and at a distance of 50 to 100 ft away from the equipment.

Stabilize Operating Conditions

Operating conditions should be stabilized as much as possible, prior to the test. The heat load on the unit and the water circulating rate should be held constant during a test run. A constant cooling range is usually an excellent indication that stable conditions have been obtained.

Readings should be taken as frequently as possible, consistent with the number of observers available and the size of the installation. Intervals between readings may vary from five to 15 minutes. Accuracy depends more upon the readings being constant than on the length of time devoted to a test run. A series of readings should be taken from which a satisfactory average may be selected for performance test analysis. Test runs so selected should consist of at least three successive readings that indicate stable conditions preceded and followed by readings showing no significant trend.

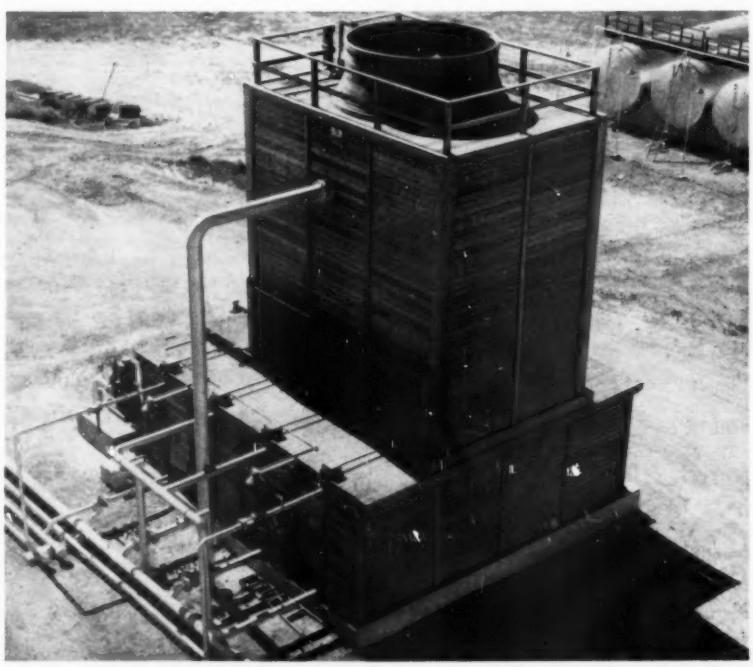


Fig. 2. This test data method should prove helpful in calculating the actual vs. predicted performance of cooling towers, like the one illustrated above

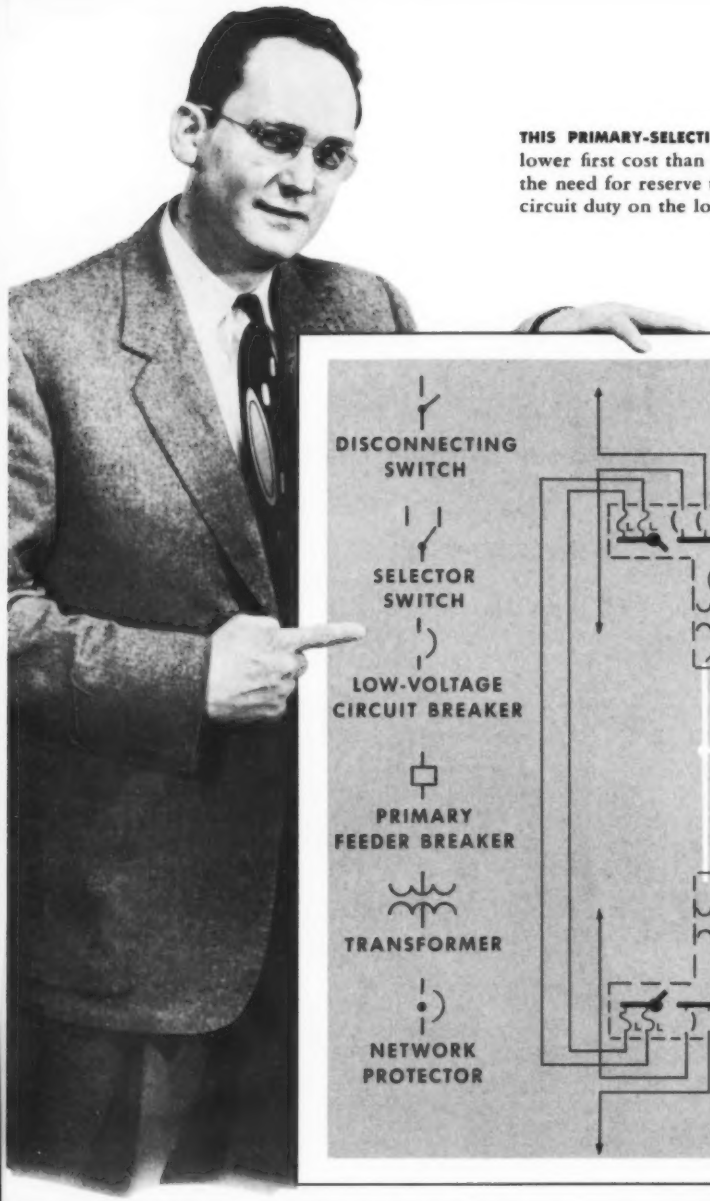
How to match your electrical system to production flexibility by:

1. Engineering power distribution
2. Standardizing high voltage control
3. Getting power to the load quickly

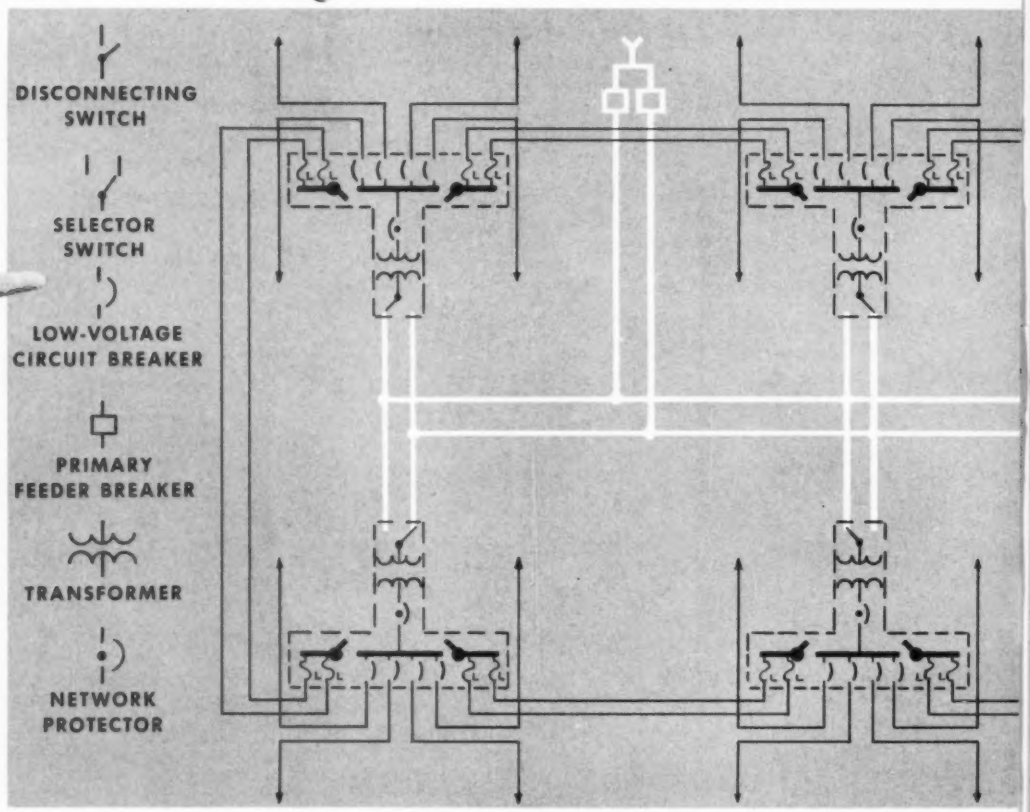
Meet Joe Harris, Westinghouse Industry Engineering Manager, who presents some ideas on improving electrical system flexibility.

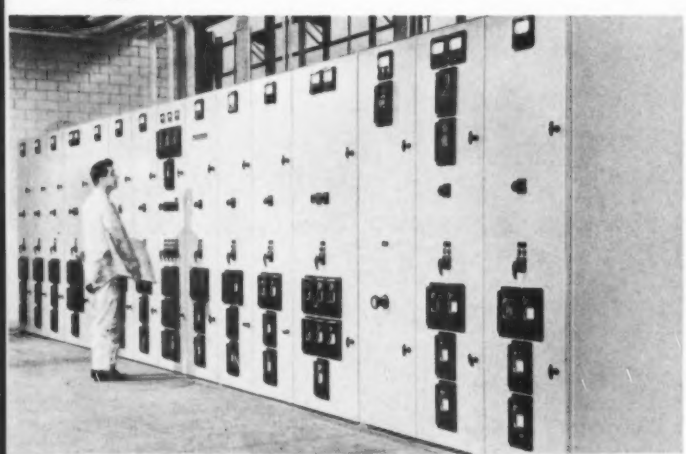
When you plan electrically for plant expansion or improvement, take advantage of Joe's wide experience in solving power distribution problems. It's part of the broad service your local Westinghouse representative offers in the talents of many design, engineering, and service specialists on the Westinghouse team.

Next page, flexibility starts with engineered distribution . . .

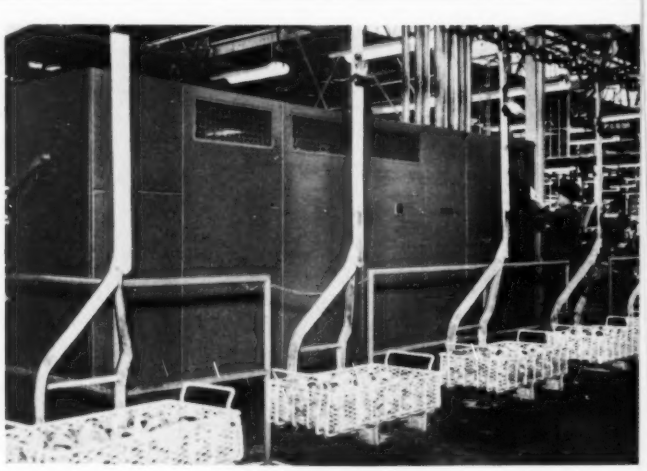


THIS PRIMARY-SELECTIVE NETWORK SYSTEM has the advantage of lower first cost than other types of networks because it reduces the need for reserve transformer capacity and reduces the short-circuit duty on the load circuit breakers.



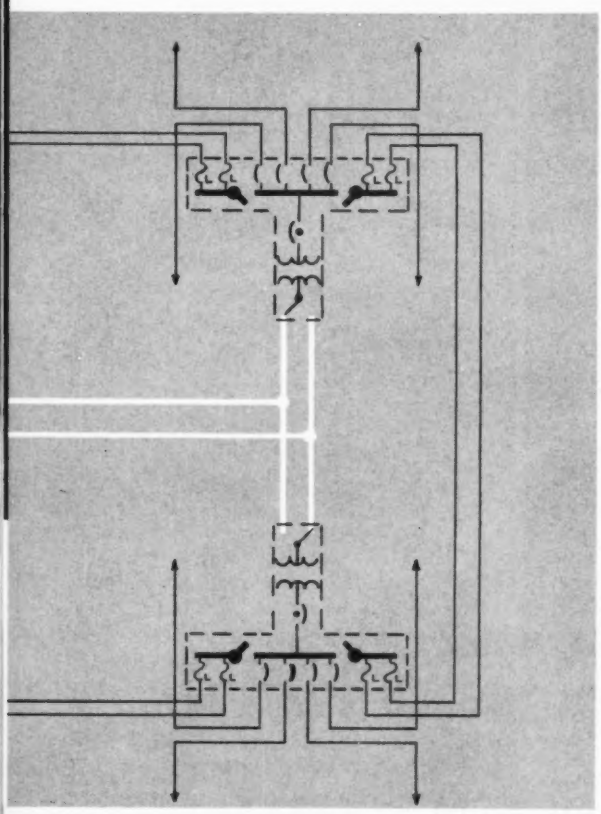


SWITCHGEAR IS EXPANDABLE in standard Westinghouse units. Standardized switchgear can be rearranged or relocated more easily to meet changes in future conditions. It also helps to speed maintenance and inspection.



HIGH VOLTAGE CLOSE TO THE LOAD is a cost-saving advantage you can achieve with Westinghouse power centers. They eliminate long, heavy secondary lines; save substantially on copper; lower line losses and improve voltage regulation.

Networks . . . one answer to flexibility, long-range planning

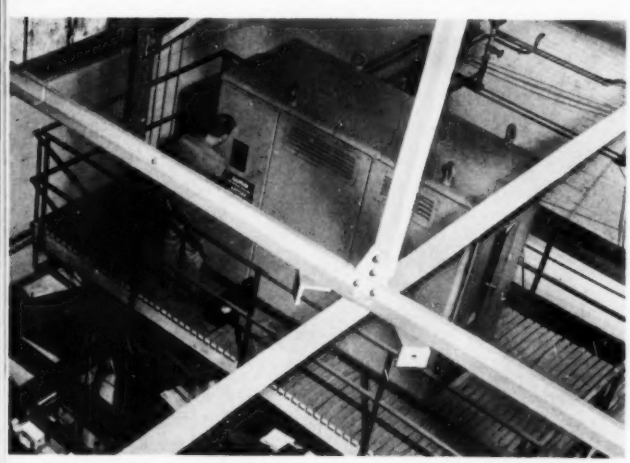


There are many excellent ways of distributing power in industrial plants. But if flexibility is your major requirement, you'll undoubtedly consider a network-type system. The slightly greater cost of a network system buys many immediate and long-term advantages. Network systems are easier to expand to handle increased power demands. Also this type of system is easily adapted to changing production needs which, in the long run, means economy.

Flexibility with this primary selective network system, for example, arises from the use of duplicate primary feeders—each capable of supplying the entire plant load. The feeder arrangement and the secondary-tie circuits permit the loads to divide among the power center, so that optimum voltage conditions are provided.

The ability to isolate any section of the system without disrupting service has obvious advantages. This permits maximum freedom in scheduling electrical maintenance or expansion, without disturbing operation of the plant. The network arrangement enables you to extend the system in any direction—at any time—with minimum rewiring and production loss.

Through the coordinating ability of your Westinghouse representative, you can take advantage of the wide experience that Westinghouse offers in engineering flexible power distribution. Coordinating equipment planning, manufacture, shipment, installation and servicing are all a part of the power distribution job handled by your Westinghouse representative. Call on him for help at any time.



SPACE CONSERVATION is another advantage of Westinghouse dry-type power centers. You can install these compact lightweight Westinghouse units up out of the way of the working area—on balconies or roofs.

YOU CAN BE **SURE**... IF IT'S **Westinghouse**

Standardized switchgear adds flexibility this way . . .

FLEXIBILITY THROUGH STANDARDIZED HIGH VOLTAGE CONTROL

For high voltage, one man can easily and quickly drawout this DH De-ion air circuit breaker for inspection or replacement. Since breakers of the same rating are physically interchangeable, new units fit without alignment troubles.

Convenient expansion or relocation with standardized metal-enclosed switchgear

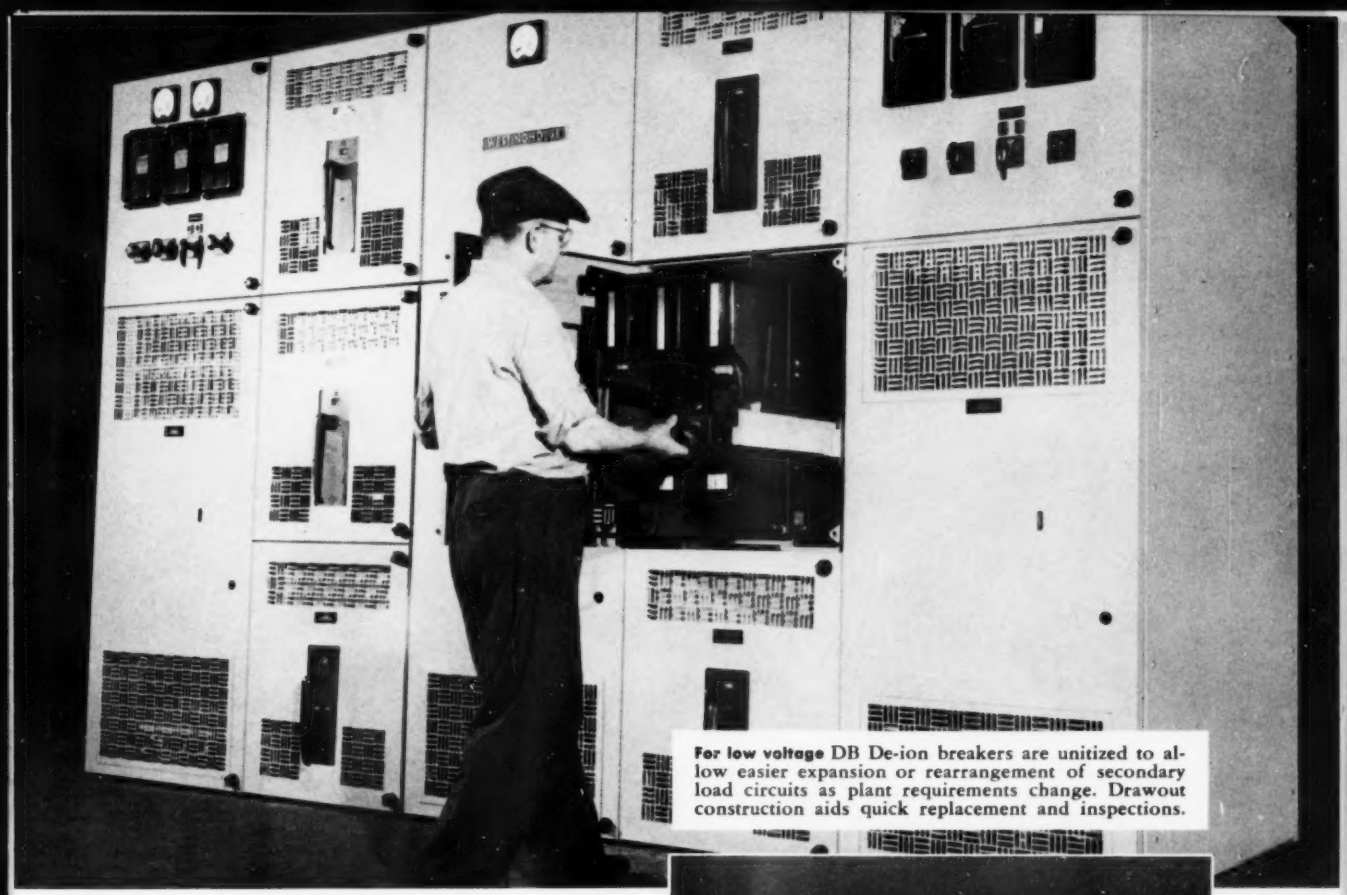
To achieve truly flexible power distribution you need equipment that is as flexible as the system itself. Nowhere is this more vital than in switchgear equipment . . . the heart of your plant's electrical control.

Westinghouse switchgear achieves flexibility through standardized frame design and manufacturing techniques. Here's what this standardization means to you:

Easy expansion or relocation A minimum number of basic units, each performing an important function, meets all the requirements normally demanded of

More flexibility per dollar is possible with Westinghouse high voltage metal-clad switchgear because all your money goes into equipment. Special engineering is held to a minimum in standard components that can be assembled in any combination required.

YOU CAN BE SURE...IF IT'S



For low voltage DB De-ion breakers are unitized to allow easier expansion or rearrangement of secondary load circuits as plant requirements change. Drawout construction aids quick replacement and inspections.

switchgear. Expansion in plant facilities is met by simply adding the required switchgear units. Production changes affecting switchgear are accommodated by substitution and rearrangement of units. And since all electrical equipment and connections are completely self-contained, entire installations can be picked up and reinstalled in another location or in another plant.

High voltage versatility Jig assembly of the breaker and stationary structure of high voltage metal-clad switchgear allows rearrangement of breaker units within the same structure. And since breakers of the same rating are interchangeable, conversion to a higher interrupting capacity can be accomplished with minimum expense.

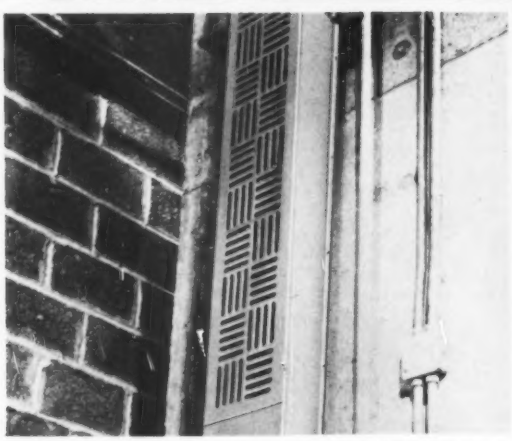
Low voltage service continuity Standardization means less production down time, too. Drawout, DB De-ion® breakers can be changed in three minutes flat. A spare breaker of the same rating can be substituted, and service continuity restored in short order.

Multi-purpose tripping provided only by Westinghouse low voltage DB De-ion air circuit breakers. Breakers allow delayed tripping on temporary overloads; trip on larger overloads before damage is done and trip instantly on short circuits.

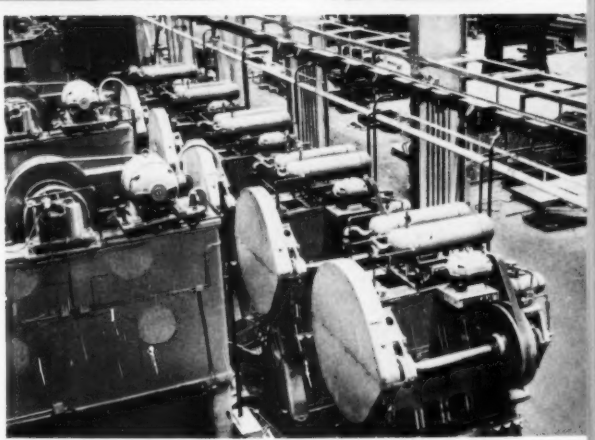
Next page, flexible equipment gets power to the load quickly . . . ⟶

Westinghouse

From switchgear . . . Power is fed directly to the plug-in duct mounted in convenient location. With drop rods in position, duct goes up in a hurry, slide cantilever hangers to position and tighten.



To branch runs . . . This 2000 ampere, low-impedance riser carries power to the upper floors. Note the use of spring suspension hangers which compensate for expansion of duct . . . allow simple installation.



To machines . . . Six power take-offs in six feet of Westinghouse bus duct spell power flexibility for any plant. Plug-in receptacles are provided for circuit breakers, safety switches, and cover-operated fusible units.

Bus duct meets changing load requirements easily

Where system flexibility really pays off is in getting power from switchgear to your production equipment. For this reason alone, bus duct is one of the best investments you can make in secondary distribution.

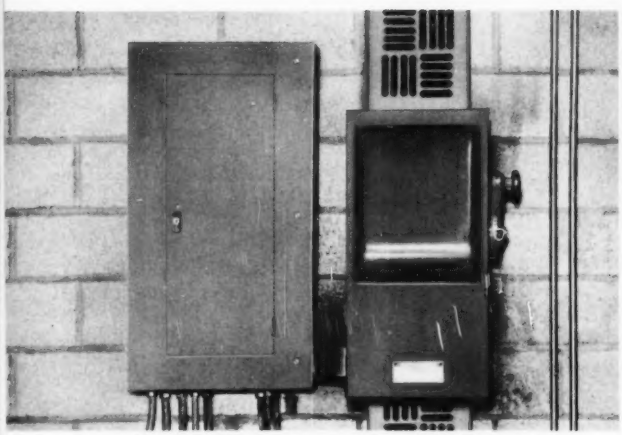
Unequaled flexibility—Power can be taken off plug-in duct at one-foot intervals for maximum convenience. Plants can be retooled, buildings revamped without rewiring because bus duct can be readily relocated and installed easily, around obstructions, in any layout.

Costs less to install—Prefabricated in sections, bus duct goes in faster than cable and conduit. Savings in installation frequently reduce the original cost below that of any other secondary power distribution equipment.

Power for future loads—Bus duct spells future savings when building alterations and improvements add to power load. It provides important reserve capacity, and what's more, is readily salvageable, dismantled, reassembled, and expanded.

More power per dollar—Up to 5000 amperes, bus duct has greater current-carrying capacity, pound for pound, than any system of wireway or cable and conduit. There are four Westinghouse types: plug-in duct with service outlets for branch runs; low-impedance duct with low voltage drop for long feeder runs; weather-proof duct for outdoor installations that is available in feeder duct; and weatherproof duct in low-impedance duct.

YOU CAN BE **SURE**...IF IT'S **Westinghouse**



To panelboards . . . Power is taken from plug-in duct. Additional circuits can be added with ease to Westinghouse Add-a-Circuit Panel, simply plug in the contact and wire up the terminals.

Control center expansion . . . Westinghouse control centers save frequently as much as 40% in installation costs over decentralized methods of mounting motor control. Saves time in inspecting control and reduces servicing problems.

Next page, how Westinghouse field engineering serves you . . . ⟶

Westinghouse field service adds a working partner to your team . . .

Westinghouse field engineers are trained to know product and industry problems. When you call on their application know-how, they become a working partner to your engineering and manufacturing personnel, consulting engineers and contractors. It removes your engineering staff from detailed planning.

Simplifies ordering problems . . . Westinghouse coordinates all manufacturing and shipping schedules to deliver matched equipment to the job at the right time. Fast delivery of genuine Westinghouse renewal parts from stock in 31 locations enables you to reduce parts inventories at your plant.

. . . and helps maintain power system flexibility

Thirty-eight large, well-equipped Manufacturing and Repair Plants are available to you for maintenance jobs on all types of electrical apparatus. These apparatus repair plants are spotted in key industrial areas to provide factory-type repairs at a local level.

* * * *

For further information on the products or services discussed in this section or for a copy of the literature listed here, call your local Westinghouse representative, or write Westinghouse Electric Corporation, 3 Gateway Center, P. O. Box 868, Pittsburgh 30, Pa.

Ask For . . .

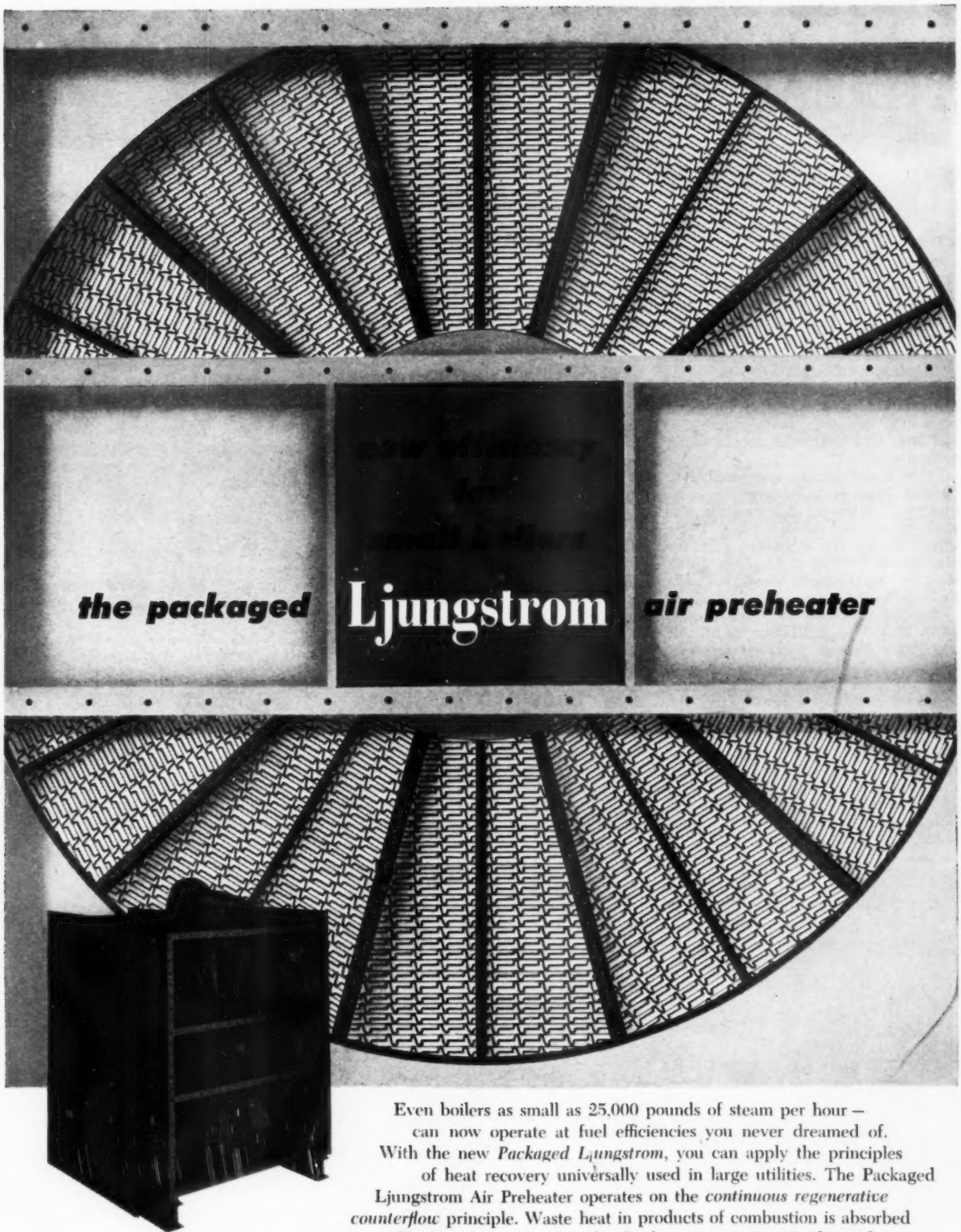
High-Voltage, Metal-Clad Switchgear	B-5306
Low Voltage, Metal-Enclosed Switchgear	B-5282
Dry-type Transformers	B-5920
Bus Duct	B-5835
AB-I Circuit Breakers	B-5456
Safety Switches	B-5457
Panelboard Planning	B-5260A
Control Centers	B-5621
Capacitors	B-3966A
Current Limiting Reactors	B-5918
Preventive Maintenance Booklet	B-5477

. . . and ask for a showing of the 20-minute film "Selecting The Right Industrial Distribution System".

56 Field Engineering Service Offices help speed completion of power system engineering, installation or modernization. Skilled Westinghouse engineers work with your personnel to coordinate product application.

Field Service Engineers are always ready to make quick inspections, adjustments and on-the-spot repairs for equipment that cannot be moved easily to one of thirty-eight Westinghouse Manufacturing and Repair Plants. MP-3014

YOU CAN BE SURE...IF IT'S Westinghouse



Even boilers as small as 25,000 pounds of steam per hour – can now operate at fuel efficiencies you never dreamed of. With the new *Packaged Ljungstrom*, you can apply the principles of heat recovery universally used in large utilities. The Packaged Ljungstrom Air Preheater operates on the *continuous regenerative counterflow* principle. Waste heat in products of combustion is absorbed on specially designed surfaces in the slowly rotating rotor. As the surfaces enter the stream of incoming combustion air, they transfer their heat to this air. The entire unit is self-contained as you receive it.

For more detailed information – get in touch today with The Air Preheater Corporation.

The Air Preheater Corporation 60 East 42nd Street, New York 17, N. Y.

For more facts circle 566 on Reply Card

← For more facts circle 565 on Reply Card

THREADED PIPING in Industry

This article discusses the many threaded pipe fittings available for industrial use . . . Sizes and types of tee, elbow and flange unions, flange and ring gaskets and application of drainage fittings are also mentioned

IN ADDITION TO cast iron, threaded pipe fittings* are also made of malleable iron, cast and forged steel, and other metals.

Malleable iron fittings are made in both plain and banded types. Malleable iron banded fittings, 150 lb, are provided with a reinforcing band of metal at each inside threaded opening, and they are substantially constructed.

Plain type fittings are similar to banded type but, having no reinforcing bands, do not possess the strength of the banded type. Plain type fittings are suitable only for low pressure water and gas lines, and for mechanical uses, such as railings, racks, etc.

Banded type fittings are available as 90 and 45 deg elbows, 90 and 45 deg street elbows, tees, service tees, crosses, 45 deg Y-bends, close, medium and open return bends, couplings, reducers, and caps. All fittings can be obtained in black or galvanized. Elbows and street elbows, 90 deg, are available in straight or reducing types, as are tees and service tees. Couplings can be obtained threaded right hand and right and left hand.

Any of these fittings can be furnished "air-tested" when so ordered. Such fittings are given an air-under-water test and are thus proved suitable for compressed air service. However, tested fittings are higher in price than untested fittings.

Plain type fittings are available as 90 deg elbows, side outlet elbows, drop elbows, tees, four-way tees, couplings, reducers, extension pieces, and caps. Locknuts and waste nuts can also be obtained for special applications.

Types of Fittings

Malleable iron fittings are also made in 300 lb rating. These are similar in design to the 150 lb banded malleable iron fittings previously described, except that they are of heavier construction. They are available as 90 and 45 deg elbows, 90 and 45 deg street elbows, tees, crosses, reducers, couplings, return bends, and caps. The 90 deg elbows and tees are obtainable either straight or reducing. These fittings are made in black only, but may be obtained galvanized to order at an advance in price.

Fittings of this type in sizes 3 in. or smaller are air tested and are suitable for 300 lb ammonia service. Usually the inside threaded openings are machine chamfered to permit soldering when desired.

Unions, Fig. 1, are available in a number of patterns and pressure ratings. Unions internally threaded on both ends (A) are made of malleable iron in 150, 250 and 300 lb ratings; and of forged steel in 300, 2000, and 6000 lb ratings.

Unions having one end internally threaded and the other end externally threaded (B) are obtainable in malleable iron in 150, 250 and 300 lb ratings; and in forged steel in 600 lb rating. The 300 lb rating malleable iron unions have externally threaded ends of steel for greater strength.

Elbow unions, 90 deg, having internally threaded union ends (C), and those having externally threaded union ends (D), are available in 150, 250 and 300 lb ratings, in malleable iron, and also with steel union ends in the 300 lb rating.

Tee unions, having the union end on the run, and in both internally (E), and externally (F), threaded union end types, are obtainable in malleable iron in 150 and 300 lb ratings. The 300 lb rating also includes a tee union with an externally threaded union end of steel.

Tee unions, having the union end on the outlet, and in both internally (G), and externally (H), threaded union end types, are available in 300 lb rating, in malleable iron, and in the externally threaded union end type, in the 300 lb rating, with steel union end.

Elbow unions, 45 deg, having in-

*First part of this article appeared in the November, 1953 issue, page 110.

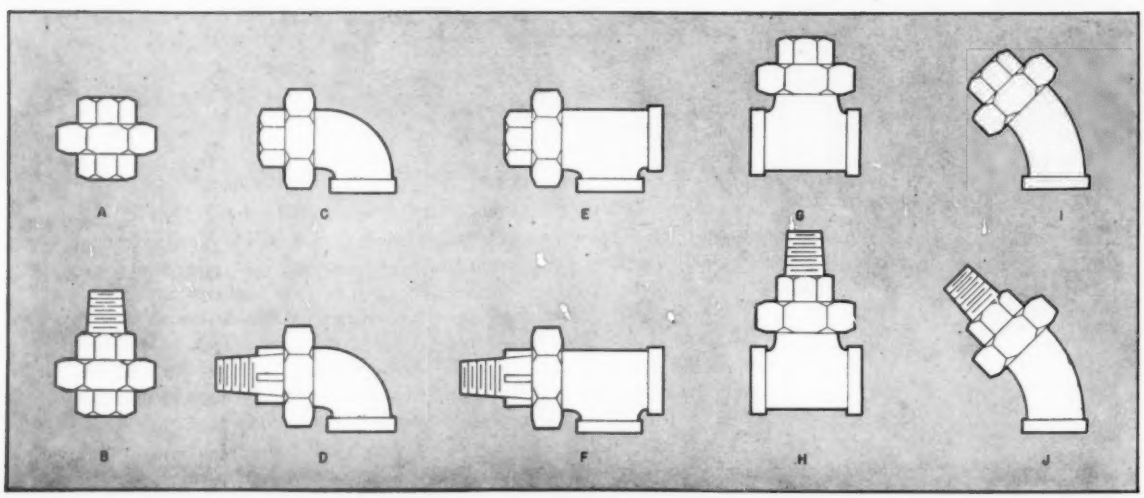
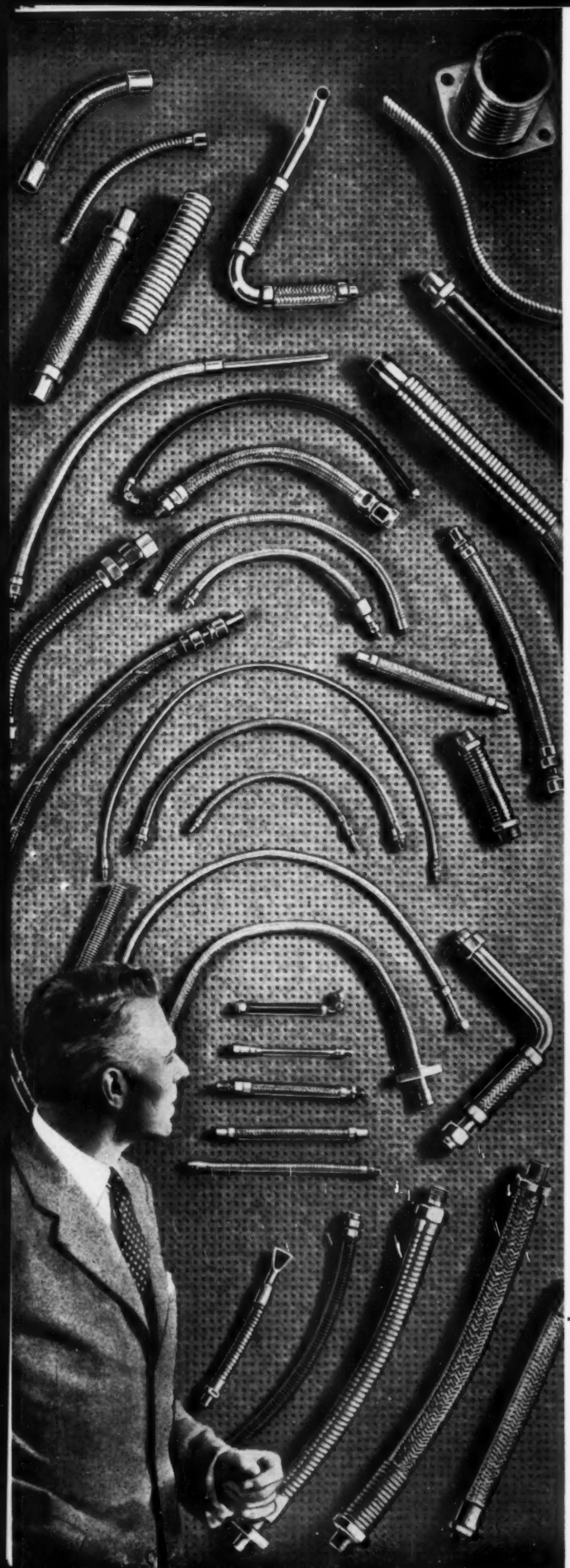


Fig. 1. Unions shown above are available in a number of patterns and pressure ratings. Depending upon type, unions are made with gasket joint, ground joint, brass to iron seat, brass to steel seat, steel to steel seat and brass to brass seat



Special design of flexible connectors costs you nothing at American

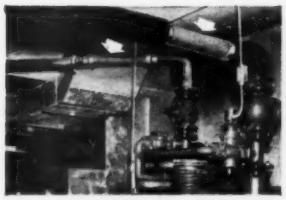
Hard to believe? Then look at the flexible connectors at left. Each was designed by *American*, complete with special fittings, to meet specific requirements. The design for each connector *costs not one cent extra.*

Vibration. Movement. Misalignment. Cramped space. Perhaps one of these is your connector problem. Or maybe it's conveying steam, water, oil, and other liquids, semisolids or gases under one or more of these conditions. Whatever it is, "American" engineers and American Flexible Metal Connectors can help you solve it.

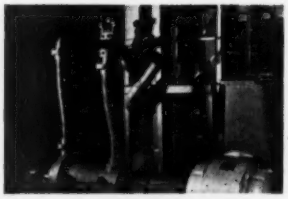
These connectors are available in bronze, brass, aluminum, steel and stainless steel, in a wide range of ID's. End fittings are adaptable to all types of connections.

Check with American *first* when you plan a new installation or want to do away with unsatisfactory connections. You'll save time and money. Remember — special design costs you *nothing* at American. 54198

Here's the easy way to solve problems of . . .

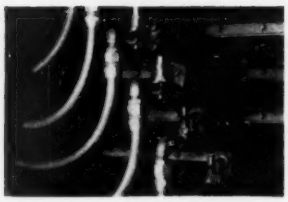


VIBRATION



MISALIGNMENT

CRAMPED SPACES



MOVEMENT

WHEREVER CONNECTORS MUST MOVE

AMERICAN

flexible metal hose and tubing

an ANACONDA® product

The American Brass Company, American Metal Hose Branch
Waterbury 20, Connecticut

Please send me Booklet CC-400 which shows how American Flexible Metal Hose and Tubing is designed, installed and used.

NAME.....
(PLEASE PRINT)

COMPANY.....

STREET.....

CITY.....ZONE....STATE.....

ternally threaded union ends (I), and those having externally threaded union ends (J), are made of malleable iron in the 300 lb rating. The externally threaded union end type is also made in the 300 lb rating with steel union end.

Depending upon type, unions are made with gasket joint, ground joint, brass to iron seat, brass to steel seat, steel to steel seat, and brass to brass seat.

Most types of unions can be obtained in black. Some types are available galvanized; others can be obtained cadmium plated all over, or only on the union ring. One type of union has the threaded half chromium plated, to prevent seizing and to resist corrosion at the seat and at the joint with the union ring.

Flange unions are shown in Fig. 2. For 125 lb saturated steam the cast iron plain face gasket union (A) is suitable. These are available from ½ to 8 in. size, black or galvanized. Where larger unions are required, two 125 lb cast iron threaded flanges may be bolted together. These flanges are made in black, but are available in galvanized at extra cost.

For 200 and 300 lb saturated steam service, the malleable iron ground joint flange union (B) may be employed. This union is equipped with a loose ring. This feature permits a tight joint to be made even when the pipe line is slightly out of alignment, and it also simplifies alignment of the bolt holes.

For 300 lb, 500 F steam service, and 300 lb ammonia service, the tongue and groove flange union (C) is available. This union employs a gasket, and is made of forged steel in sizes 3 in. and smaller and of malleable iron in 4 in. size. Where space is limited, the two-bolt flange (D) is employed. Flange unions similar to (C) and (D) are also made of forged steel, with ground joints, in 2000 and 6000 lb pressure ratings.

The combination elbow (E) permits angle connections to be made in close quarters, and eliminates the need for one fitting and two joints.

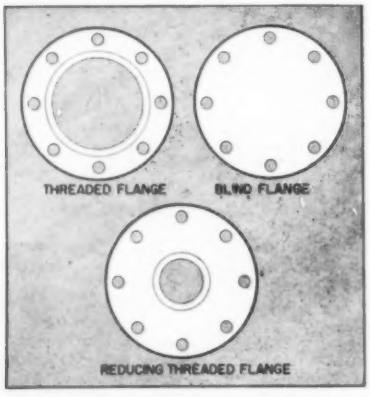


Fig. 3. Several types of cast iron threaded flanges are illustrated above

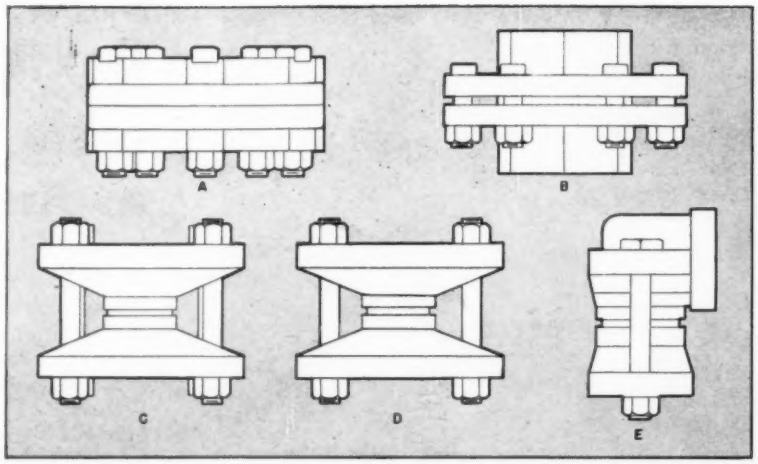


Fig 2. Flange unions illustrated include: (A) plain face gasket; (B) ground joint; (C) tongue and groove; (D) two-bolt flange; and (E) combination elbow

Cast iron threaded flanges, Fig. 3, are made in 125 lb (up to 12 in. size) and 250 lb saturated steam pressure ratings. Flanges are regularly furnished in black, but may be obtained in galvanized on special order at an advance in price.

Forged steel threaded flanges are available for pressure ratings of 150, 300, 400, 600, 900, 1500 and 2500 lb. These flanges are also available in eccentric reducing patterns, made to order.

On Ordering Reducing Flanges

When ordering any reducing flanges, the reduced size should be designated first; then the outside diameter of the flange. For example, a 600 lb flange to connect a 6 in. pipe to a 10 in. valve or fitting (outside diameter of flange, 20 in.) should be ordered: 6 in. by 20 in. reducing flange.

Flanges for general service and temperatures below 500 F may be bolted with square head steel machine bolts and hexagon nuts, or continuous threaded steel studs and nuts for continuous threaded steel studs. These are tightened in staggered sequence with end wrenches. The bolt or stud threads should be coated with pipe thread lubricant. This permits easier tightening of the joint and prevents seizing of the bolt or stud threads, thus permitting the joint to be readily taken apart.

Flange gaskets are made of various materials to suit operating conditions. For steam temperatures up to 600 F, woven asbestos or corrugated or plain copper gaskets are used. For steam temperatures up to 220 F, wire inserted red rubber gaskets are employed.

In hot water service, wire inserted red rubber or black rubber gaskets are used for medium and high pressures. For low pressures, cloth inserted brown rubber or compressed asbestos is employed.

Gaskets for cold water service may be made of soft rubber, asbestos, cloth inserted brown rubber, black rubber, or wire inserted red rubber.

For air temperatures up to 750 F, compressed asbestos gaskets are used; while for temperatures up to 220 F, red rubber gaskets are employed.

In ammonia service, thin asbestos gaskets are used for hot ammonia, sheet lead for cold ammonia, and red rubber for weak solutions. For ammonia temperatures up to 700 F, compressed asbestos gaskets are employed.

For gas temperatures up to 600 F, woven asbestos gaskets are used; and for temperatures up to 220 F, red rubber.

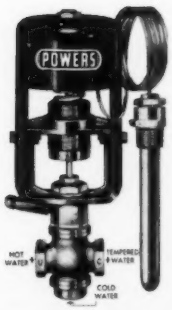
Where oil temperatures do not exceed 212 F, cork-fiber gaskets are used; up to 300 F, neoprene compressed asbestos; and up to 750 F, compressed asbestos.

Ring gaskets, covering the face of the flange to the inside edge of the bolts, are generally employed except for very soft materials, such as rubber. Full face gaskets are used when soft materials are employed to reduce unit pressure and minimize crushing. Ring gaskets for unions or union fittings employing gaskets are generally made of rubber or asbestos. Where tongue and groove flanges are used, the gasket is cut to fit the recessed part of the flange.

When installing flange gaskets, it is advisable to coat the flange faces and gasket faces with pipe thread lubricant. This helps insure tight

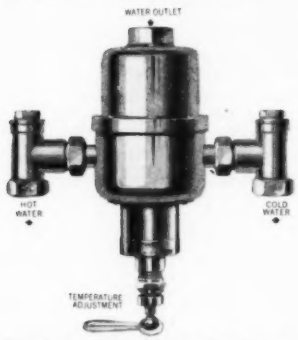
Keep Your Copy Intact

Readers wishing tear sheets of any article appearing in the issue for their personal file may obtain them by indicating the item desired on one of the post cards appearing in this issue.—Editors

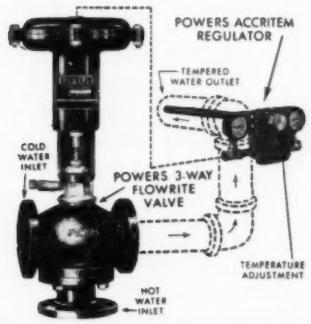


POWERS No. 11 Self-Operating REGULATOR with 3-way Valve. Thermostatically mixes hot and cold water. Delivers a mixture at any temperature desired. Valve sizes ½" thru 2". Capacities 20 to 250 gpm @ 45 psi. Write for Bulletin 329.

POWERS Type H Thermostatic Water Mixer. Used for many processes. Users report accuracy of ± ½° F. Insures utmost comfort and safety in showers and hand washing fountains and hydro-therapy. Capacities: 2 to 10 gpm @ 45 psi. Write for Bulletin 365.



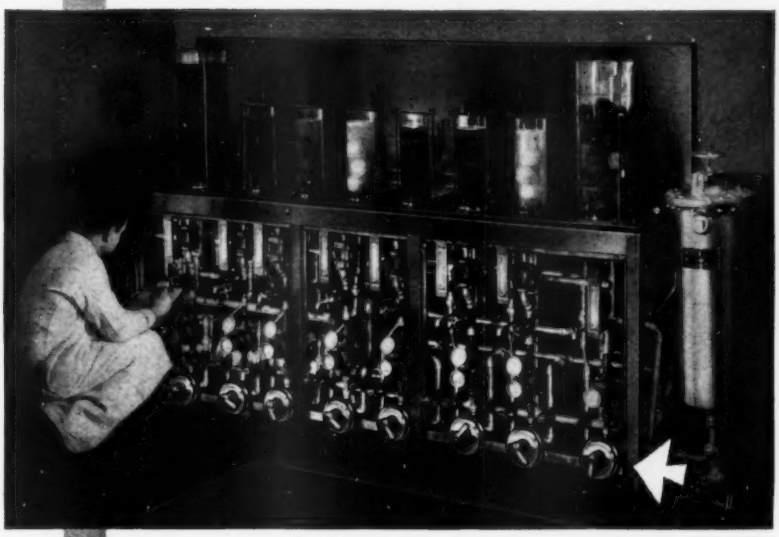
POWERS Thermostatic Water Controller. Capacities 22 to 125 gpm @ 45 psi. Used for gang showers, processes and hospital hydro-therapy. Write for Bulletin 361.



POWERS Large Capacity Thermostatic Water Mixing Valve. Controlled by an ACCRITEM Air or Water operated Temperature Regulator. Capacities 20 to 1200 gpm @ 45 psi. Temp. Ranges: 50° F. to 250° F. and 150° to 350° F. Write for Bulletin 316.

Nalco® Laboratories

got the Right Type of Control



for this testing operation

they called... POWERS

For Accurate Temperature Control of Water used in testing solubility rate of Nalco water treatment formulas, National Aluminate Corp. installed Powers Type H Thermostatic Water Mixers shown above. This is only one of many possible applications for this versatile temperature regulator.

Double-Safety of Powers Type H Mixers enable them to deliver water at a constant temperature regardless of **pressure** or **temperature** changes in water supply lines. Failure of cold water supply instantly shuts off delivery. Some users report ± ½° F. control. They often pay back their cost several times a year. Fully described in Bulletin 365.

Check your temperature control requirements with an experienced Powers engineer. Contact our nearest office or write us direct.

Some of POWERS Many Types of Controls that thermostatically mix hot and cold water and deliver a mixture at a pre-determined temperature are shown above. All are described in Condensed Catalog WC. May we send you a copy?

THE POWERS REGULATOR COMPANY

(b71) SKOKIE, ILLINOIS • Offices in over 50 Cities in U. S. A., CANADA and MEXICO • See Your Phone Book

OVER 60 YEARS OF AUTOMATIC TEMPERATURE CONTROL

For more facts circle 568 on Reply Card

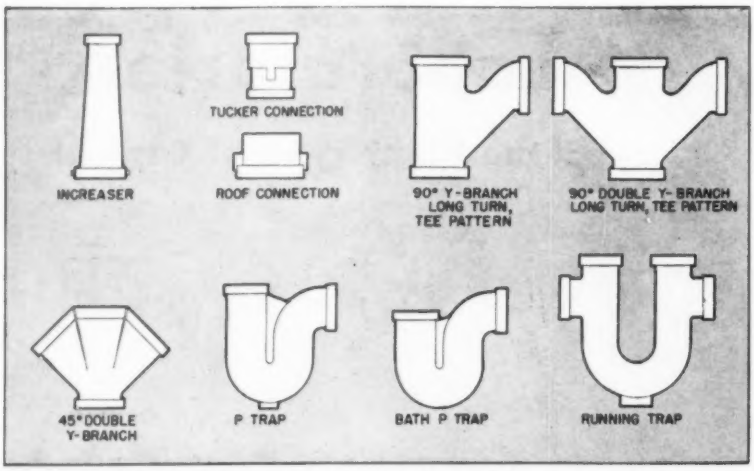


Fig. 4. Drainage fittings are ordinarily made of cast iron but are obtainable, on special order, in malleable iron or brass. They are also available galvanized

joints and permits easier disassembly.

Threaded fittings for high pressures are made of forged steel and cast steel. Forged steel threaded fittings are available in 2000, 3000 and 6000 lb ratings and in sizes from ⅛ to 4 in. Galvanized fittings can be made to order.

For larger size applications, cast carbon steel threaded fittings are available to 12 in. size, rated at 1000 lb. These fittings can also be obtained in alloy cast steel, made to order, for elevated temperatures.

Caps, plugs and bushings rated at 3000 and 6000 lb are made of carbon steel, but they can be made to order of alloys or stainless steel.

Cast steel flanged fittings are available in 150, 300, 400, 600, 900, 1500 and 2500 lb ratings. The 150 lb fittings are made of carbon steel; the others are made of alloy steel. Special angle elbows, base and anchorage tees, and other unusual fittings can be made to order.

Drainage fittings (also used for central vacuum cleaning system piping), Fig. 4, are ordinarily made of cast iron, except the Tucker connection which is usually made of malleable iron. However, on special order, drainage fittings are obtainable in malleable iron or brass.

Generally all drainage fittings having inside threaded openings at right angles have the threads tapped pitched, so that the horizontal line will pitch ¼ in. per foot, to assure positive drainage. Wherever practicable, the face of the pitched opening is tilted ¼ in. per foot. However, unpitched fittings are obtainable when specified. Drainage fittings are available galvanized, black, or uncoated. The black fittings are usually coated with black japan.

Drainage Fittings

Drainage fittings are available in a great variety of patterns. These include straight and reducing 90 deg elbows, 60, 45, 22½ and 11½ deg elbows, 90 deg side outlet and heel outlet elbows, 90 and 45 deg street elbows, 90 and 45 deg long turn elbows, 90 deg extra long turn elbows, and three-way elbows.

Also straight and reducing tees, tee pattern 90 deg Y-branches, double Y-branches, long turn tee pattern 90 deg Y-branches and double Y-branches, 45 deg Y-branches and double Y-branches, and straight basin tees and couplings, and increasers. Some of these fittings are illustrated in Fig. 4.

And, in addition, Tucker connections (for connecting threaded pipe to bell and spigot pipe), roof connections (for providing a counterflashing on vent pipes where they pass through a roof), running traps, P traps, and bath P traps.

In "reading" reducing fittings, both threaded and flanged, the sequence of the letters A, B, C and D should be followed, as shown in Fig. 5, to designate the outlet sizes in order. For example: As shown, a side outlet cross would be designated as

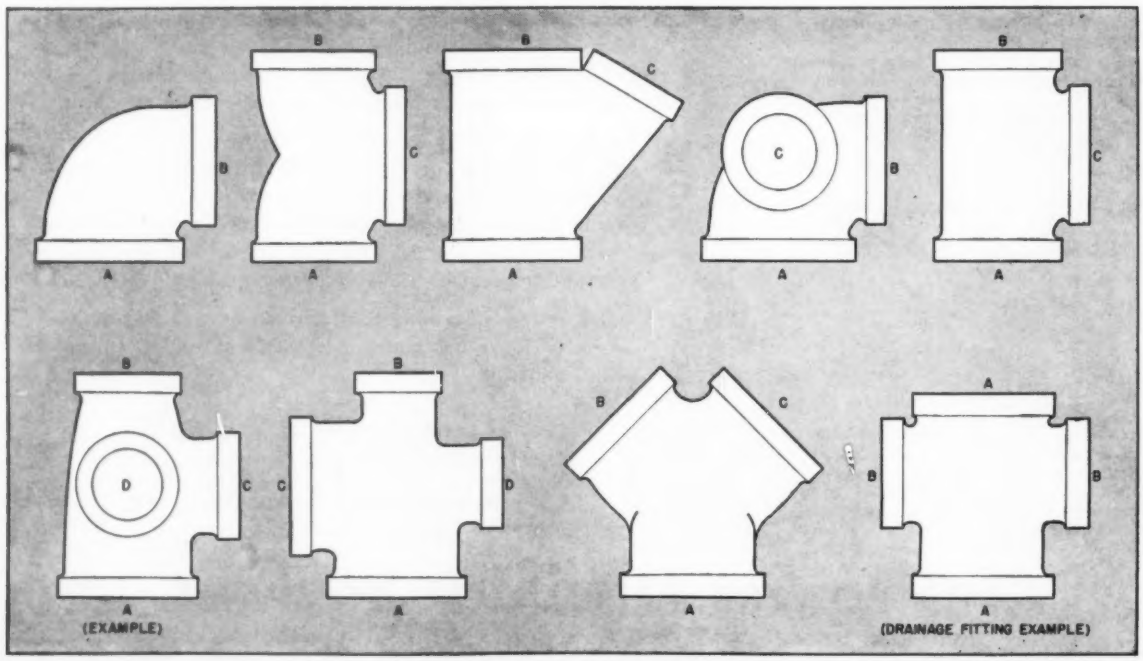
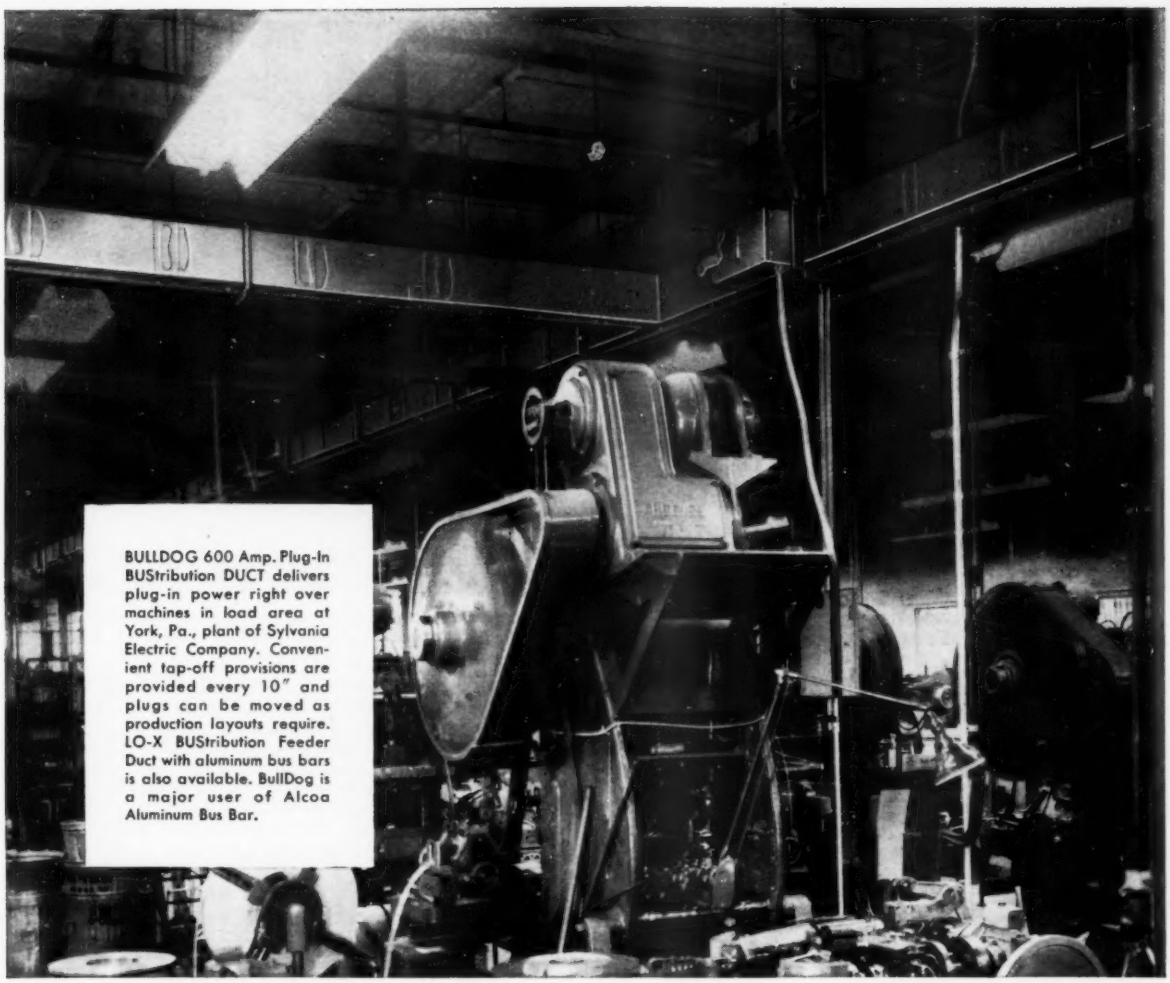


Fig. 5. In "reading" reducing fittings, both threaded and flanged, the sequence of letters A, B, C and D should be followed to designate the outlet sizes. On elbows, larger opening is named first; on side outlets, outlet size is last



BULLDOG 600 Amp. Plug-In BUStribution DUCT delivers plug-in power right over machines in load area at York, Pa., plant of Sylvania Electric Company. Convenient tap-off provisions are provided every 10" and plugs can be moved as production layouts require. LO-X BUStribution Feeder Duct with aluminum bus bars is also available. BullDog is a major user of Alcoa Aluminum Bus Bar.

YOU CAN SAVE 10% ON BUS DUCT WITH ALCOA ALUMINUM BUS BAR!

The initial cost of Alcoa® Aluminum Bus Bars allows BullDog and other manufacturers to price this superior product lower than bus duct using other conductor materials. Since aluminum bus bars are as much as 41% lighter than copper bus bars, bus duct with aluminum bus bars assures easier, less costly installation and relocation with decidedly less strain on building superstructures. Bus duct with aluminum bus bar is completely interchangeable with other bus duct systems.

Wherever or whenever production requirements demand an efficient, flexible electrical distribution system, specify bus duct with Alcoa Aluminum Bus Bars. For the names of manufacturers using this modern electrical metal in their bus duct systems, write: ALUMINUM COMPANY OF AMERICA, 2089-E Alcoa Building, Pittsburgh 19, Pa.

THE MODERN ELECTRICAL METAL

ALCOA ALUMINUM

ALUMINUM COMPANY OF AMERICA

For more facts circle 569 on Reply Card

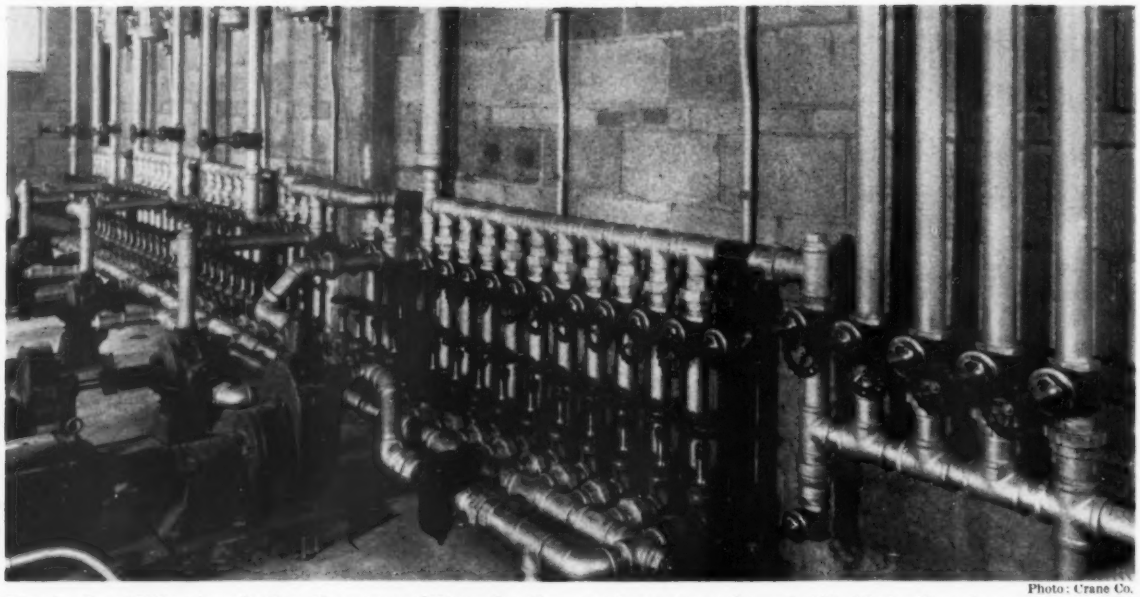


Photo: Crane Co.

Fig. 6. In addition to selecting the proper fittings for the job at hand, it is also important to arrange the piping in a neat manner as shown in this illustration of numerous valves, headers and fittings required to direct the flow of liquids

2½ (A) by 1½ (B) by 1½ (C) by 1½ (D). The letters in parentheses are given only for reference and are not included when ordering.

It will be noted that the larger opening of elbows is named first. In tees, crosses, double branch elbows, and 45 deg Y-bends, the letters A and B designate the ends of the run, while the letter C, or C and D, designate the outlet or outlets. On side outlet reducing fittings, the size of the side outlet is named last.

An exception to the above occurs in the case of drainage fitting crosses and double Y-branches, having both openings on the run equal in size and both openings on the outlet equal in size. These fittings are designated as shown in Fig. 5, by only two dimensions. For example: A cross having such dimensions is designated as 2 by 1½.

Fittings and flanges are suitable for the liquid working pressures specified only when used in hydraulic installations in which shock is absent or negligible.

When a valve in a hydraulic system is suddenly closed, the moving body of liquid is stopped instantaneously. Since a liquid is relatively incompressible, this sudden stoppage of flow raises the pressure considerably above the working pressure. This increase in pressure is called "shock" and may, in some instances, be sufficient to cause pipe, fittings or valves to fail.

The author recalls an instance in which a cast iron check valve installed in the outlet line of a centrifugal water pump burst from shock. When the pump, which supplied water storage tanks on the 22nd floor of a hotel, automatically stopped, the check valve jammed in open position, permitting the 275 ft column of water to flow in reverse through the pump. Suddenly, the check valve closed, stopping the flow of water instantaneously. The sudden increase in pressure burst the wall of the check valve.

This increase in pressure due to shock depends upon the velocity at which the liquid is flowing in a system, not upon the working pressure. For example: In a system in which the working pressure is 100 psi, with a velocity of 3 fps, the pressure increase due to instantaneous closure of a valve will be the same as in a system having a working pressure of 1000 psi and the same velocity.

Shock usually occurs in lines with check valves, quick closing valves, or in lines supplied by reciprocating pumps. However, shock may also be produced, to a lesser degree, by the rapid closure of globe or gate valves. Therefore, care should always be taken not to close such valves rapidly in lines transporting liquids.

"No, that isn't it either . . . try again."

Where shock is likely to occur, the maximum shock pressure should be added to the working pressure in determining the working pressure rating of fittings, flanges, and valves to be used in a system.

It is advisable to equip all hydraulic systems with air chambers or other types of shock absorbers, to eliminate, as much as possible, pressure increase due to shock.

In selecting threaded fittings and flanges, it is necessary to stipulate the required pressure rating at the required operating temperature, since the pressure rating of a particular fitting or flange decreases as the operating temperature increases. This is made necessary by the characteristic of metal called plastic flow, in which metal gradually stretches under pressure when subjected to elevated temperatures. For example: The working pressure of a 1000 lb rating cast steel threaded fitting in steam, water, oil, oil vapor, gas or air service is 1000 lb, non-shock, at 100 F. However, the working pressure of the same fitting is only 165 lb, non-shock, at 1000 F.

Generally, where cast iron threaded fittings are marked with numerals not followed by any suffix symbols, the numerals indicate the saturated steam pressure rating. Where the numerals are followed by the letters "WOG," this marking indicates the water, oil, or gas service pressure rating at or near atmospheric temperature. Where two sets of numerals are included, the steam service pressure is followed by the letter "S," and the water, oil, or gas service pressure is followed by the letters "WOG."

THE GREATEST NAME IN ELECTRICAL WIRE AND CABLE

For the Answers to Your Wiring Problems . . .

ASK THE MEN WHO KNOW

BARE, WEATHERPROOF, INSULATED WIRES and CABLES FOR EVERY ELECTRICAL PURPOSE

At General Cable our engineers devote themselves as much to customers' wire and cable problems as they do to the design and manufacture of the products you buy.

We would like you to think about this engineering service next time you face a wire or cable problem.

You see, our engineering staff is recognized as one of the industry's most authoritative groups of its kind. Ready at any time . . . to go anywhere, General Cable engineers can assist you in the solution of any electrical wire or cable problem . . . can quickly recommend and provide the most practical product for the job at the least possible cost.

So—on any problem—transmission, distribution, power, control, lighting, or electrical equipment, check General Cable first. You'll be dealing with the men who know.

GENERAL CABLE CORPORATION 420 Lexington Avenue, New York 17, New York

Sales Offices: Atlanta • Buffalo • Cambridge (Mass.) • Chicago • Cleveland • Dallas • Detroit • Greensboro (N. C.) • Houston Indianapolis • Kansas City • Los Angeles • Milwaukee • Minneapolis • New York • Newark (N. J.) • Philadelphia • Pittsburgh • Portland (Ore.) • Rome, N.Y. • Rossmoyne, O. (Cincinnati area) • St. Louis • San Francisco • Seattle • Syracuse • Tulsa • Washington, D. C.

For more facts circle 570 on Reply Card

What's New in Buildings?

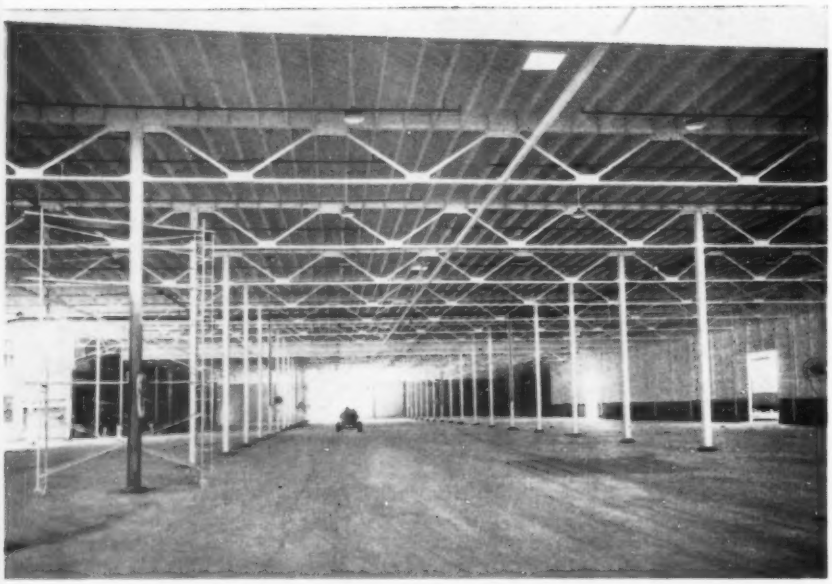


Fig. 1. Interior view of the completed steel-wood-framed warehouse built for Pioneer-Flintkote Co., Los Angeles by J. H. Pomeroy & Co., Inc., Los Angeles. Trusses are combination of wood and steel—wood for its good compression characteristics, steel because of its efficiency when subjected to tension

Wood and Steel Team Up with Best Foot Forward

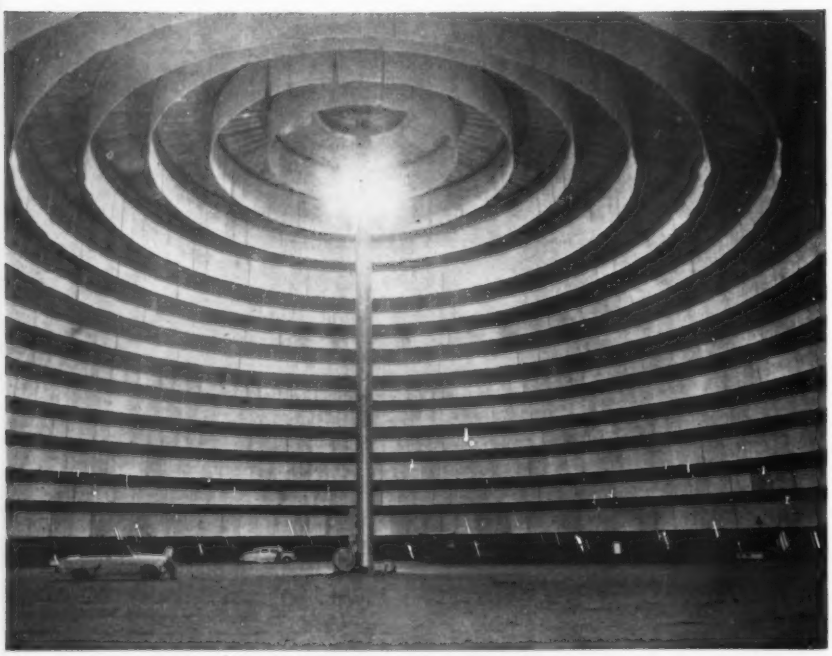
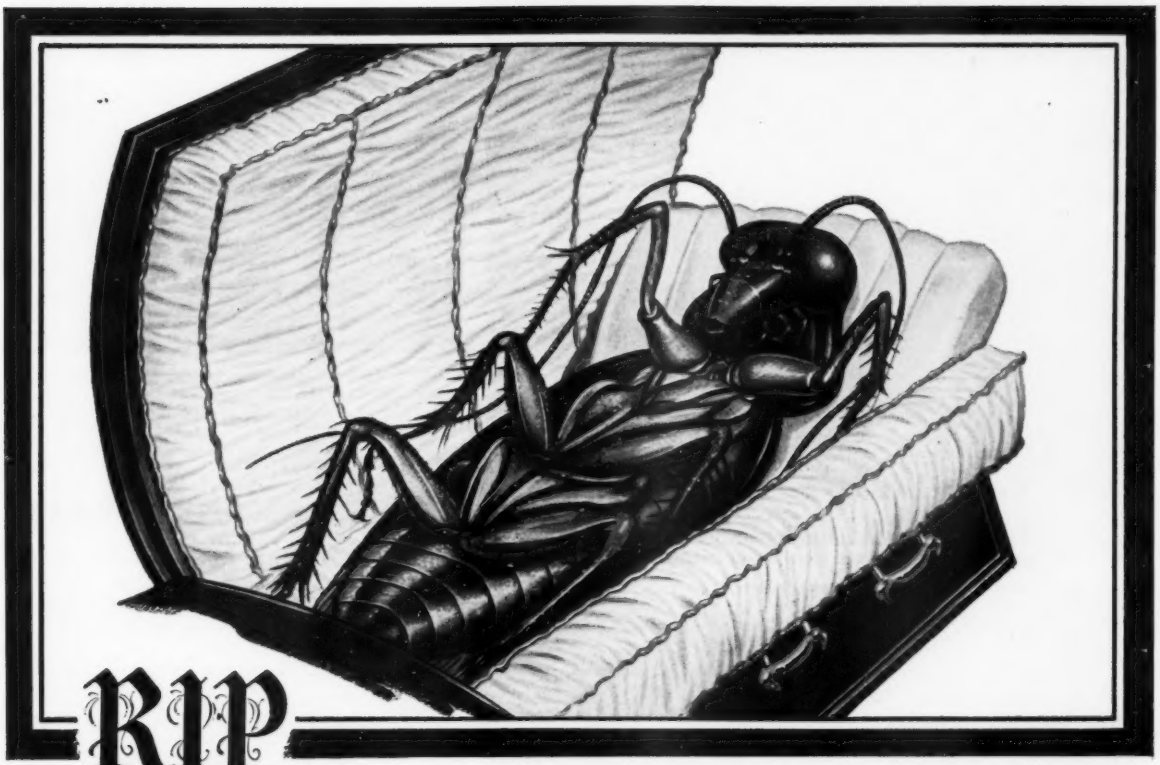


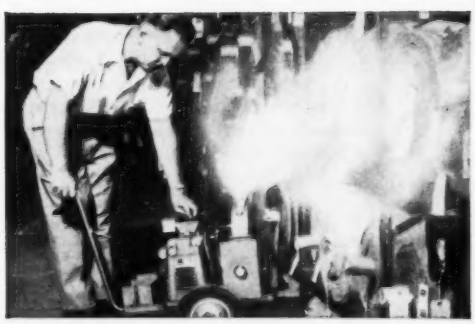
Fig. 2. Interior of the LeTourneau Semisphere buildings. Relative sizes of automobiles and their drivers give some idea of vast amount of unobstructed interior space. Concentric rings of acoustical material have been suspended from ceiling of dome for sound control. Near top is the lighting installation of 75,000 watts

Aluminum and Steel Join Hands in Semisphere

And for More Photos and Details Turn the Page



control insects with VAPOSECTOR!



West Atomizing Equipment (portable or permanent) has exclusive suction spray nozzles that produce a "dry fog" with uniformly sized 8-micron VAPOSECTOR droplets. These nozzles use less insecticide, cover a wider area, produce a greater kill.

High-potency VAPOSECTOR is formulated for the realist who has an insect problem and wants to get rid of it – *fast!*

VAPOSECTOR is many times more concentrated than the standard grade AA spray – and over four times as economical in use. There's no danger of contamination or odor when used according to directions. It is noncorrosive and will not injure metals, finished surfaces or fabrics, when used as directed.

VAPOSECTOR controls insects by "double penetration." When used with West atomizing equipment, it becomes a "dry fog" that reaches and penetrates hiding places, and then penetrates the insect's outer covering for a permanent kill. Insects have no place to hide, no time to escape. Demonstrations have revealed dead insects in numbers never thought possible.

West can supply VAPOSECTOR, special mill sprays and fumigants, residual and contact insecticides, spraying equipment – *or a complete insect control program tailored to fit your needs!*

WEST DISINFECTING Company

42-16 West Street, Long Island City 1, N. Y.
In Canada: 5621-23 Casgrain Ave., Montreal
Branches in principal cities

WANT DETAILS?
Tear out this coupon and mail it with your letterhead.

☐ I'd like a FREE copy of West's 36-page booklet on INSECT CONTROL.

☐ I'd like to talk to a West representative about INSECT CONTROL – without obligation.

Dept. 52

For more facts circle 571 on Reply Card

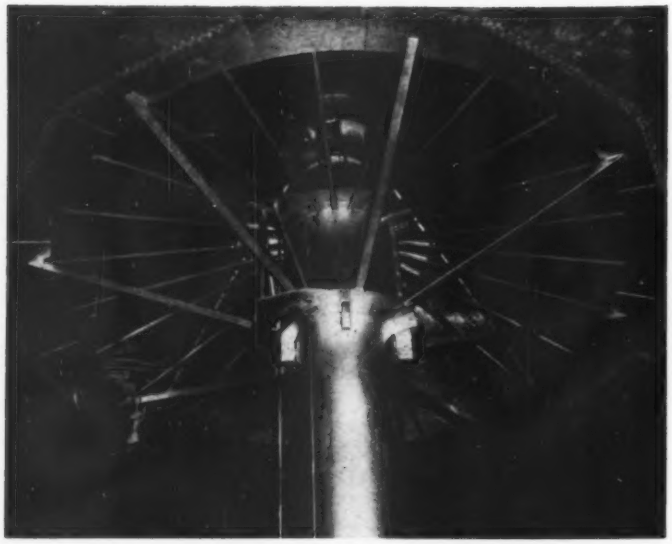


Fig. 3. This is an underside view of the peak structure at its final position near the top of the centerpole of the Semisphere. Through the spokes of the peak structure can be seen underside of aluminum hood

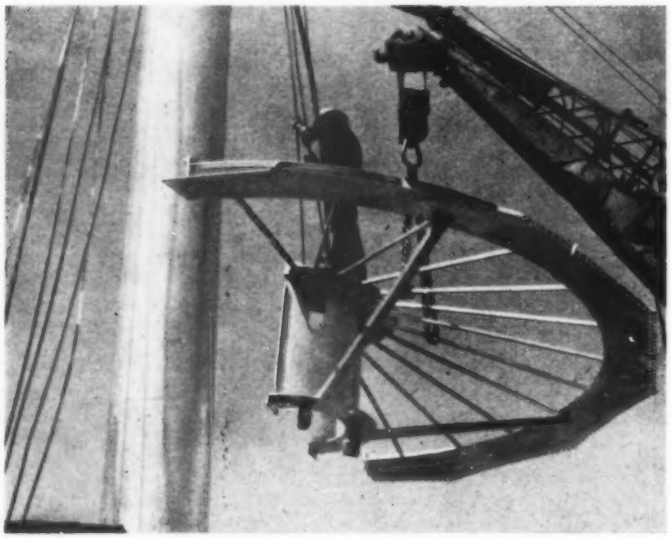


Fig. 4. Workman guides half of peak structure into assembly position. Next aluminum sheets will be bolted to it. When construction starts this structure is near bottom of center pole. Fig. 5. Below: Electric winches are located at the base of the center pole of the Semisphere. The 36-in. drum at the left handles the cable that raises the entire dome as it is assembled. Small winch at right controls position of ventilating dome

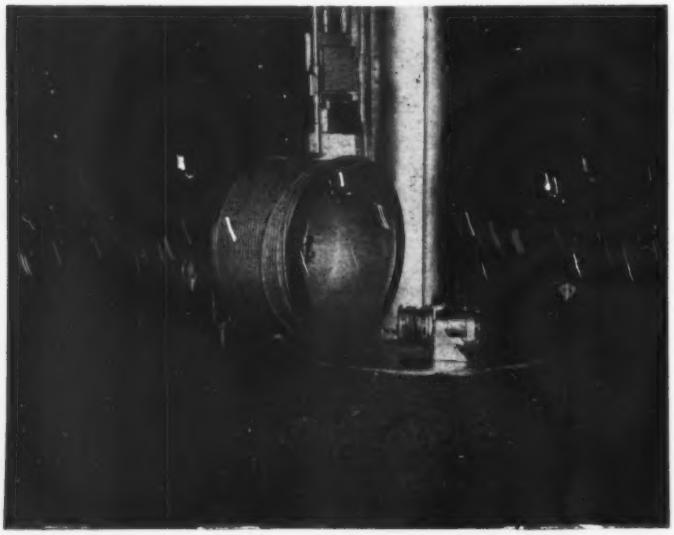


Fig. 6. Aerial view of Semisphere building. Cone-shaped peak at top of the dome controls the rate of ventilation of the unusual building

The Semisphere

Approximately 150 highway truck-trailers or 450 automobiles could be parked in a huge dome-shaped building just completed at Longview, Texas. There are no interior structural supports in this 85-ft-high, 300-ft-diameter building, and all of the assembly work to create it out of aluminum and steel was accomplished at ground level. This spacious structure, the LeTourneau Semisphere Building, is a product of R. G. LeTourneau, Inc., and was built adjacent to the LeTourneau Longview plant and corporation headquarters.

Similar buildings can be erected anywhere else in the world by shipping the prepared metal parts to the site. These new structures provide weather-tight floor space and cubic capacity at far less cost, LeTourneau points out, than conventional methods of construction, and they can be erected quickly by semi-skilled labor.

The Semisphere covers 70,686 sq ft of floor area and contains 3,289,402 cu ft of enclosed space. Completely erected, it will sell at less than $4 per square foot of space afforded.

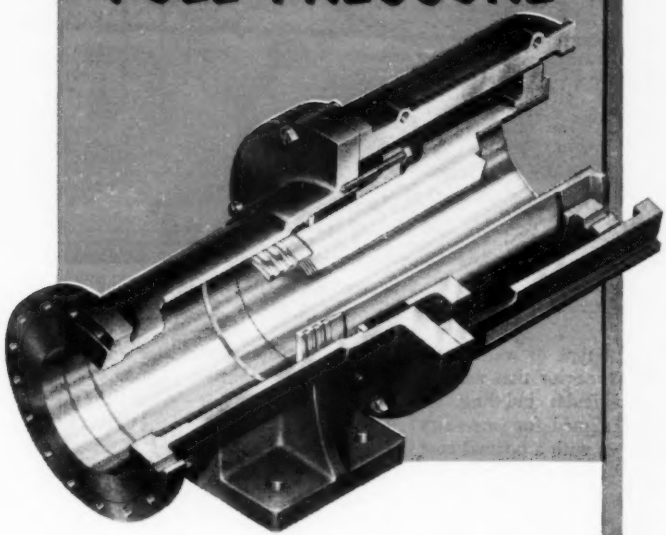
The new Longview building is a partial sphere. It is actually a segment of a sphere which, if complete, would have a radius of 173.2 ft. The wall at the bottom edge of the dome makes a 60-deg angle with the ground level. Headroom is thus provided almost at the very outer edge of the building.

Putting the Semisphere together is a case of building from the top down, but the building work is all done on the ground. A necessary preliminary is the installation of a steel center pole 94 ft high for use in building erection.

The dome begins to grow when a sliding steel collar—called the peak structure—is raised gradually up the center pole and 15 successive rings of aluminum sheets are bolted on. An

ADSCO EXPANSION JOINTS...

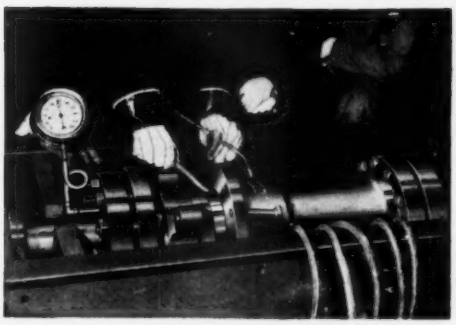
UNPACKED AT FULL PRESSURE



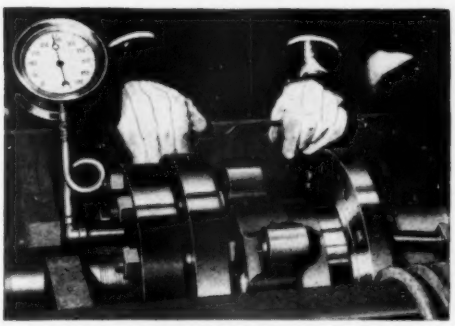
▶ ADSCO piston-ring expansion joints can be serviced . . . in fact, unpacked and repacked . . . under full line pressure. There is no interruption of service, no down-time for repacking, because the job is done under normal working conditions.

▶ Yet this isn't the only great feature of this high-quality joint. Slip is completely guided . . . split external guide permits smaller manholes . . . limit stops prevent over-travel of slip . . . polished surface cannot be scored because slip is in contact with packing only . . . misalignment is prevented by both internal and external guiding. ADSCO piston-ring expansion joints are available in a full range of sizes, with 4", 8", or 12" traverse per slip, for pressures to 400 psi and greater and for temperatures to 800F and higher. Call an ADSCO representative or write for Bulletin 35-15H.

. . . and here's proof



Last strand of packing being withdrawn from stuffing box.



Close-up photograph shows all packing removed. With steam at 240 lbs. pressure and with 300° superheat there is no trace of steam in the empty stuffing box.

With periodic adjustments of the gland, it may never be necessary to repack the stuffing box in an ADSCO piston-ring expansion joint. However, lack of maintenance may make it necessary at some time to do so and the job is easy with this ADSCO joint. The piston rings hold the line pressure during the unpacking and repacking operation. With the vent valve open, the vent chamber is at atmospheric pressure and, under this condition, no steam can enter the stuffing box space. Thus complete repacking can be done under full line pressure.

ADSCO ENGINEERED PRODUCTS

EXPANSION JOINTS
HEAT EXCHANGERS
STEAM TRAPS
STRAINERS
SEPARATORS
METERS

AMERICAN DISTRICT STEAM COMPANY, INC.

GENERAL OFFICES
NORTH TONAWANDA, NEW YORK
PLANTS: NORTH TONAWANDA, N. Y., AND RICHMOND, CALIF.

For more facts circle 572 on Reply Card

electric winch does the raising. Jackstands steady the bottom edge of the partially-constructed dome during the attaching of each new ring of sheets.

Unobstructed interiors make the building adaptable to many purposes. Finishing details and utilities, such as interior surface treatment, lighting, heating, ventilation, air conditioning, acoustics and floor material . . . all of these can be whatever the building's function calls for.

Wood and Steel

A HIGHLY ECONOMICAL and unique industrial building was recently designed and constructed by J. H. Pomeroy & Co., Inc., Los Angeles. The novelty and economy of the first experiment have since been borne out as the new design has proved its value in several later structures. It was designed by Henry Maag of the Pomeroy firm.

Both Fig. 1 and Fig. 7 illustrate a warehouse built in less than seven weeks by the J. H. Pomeroy & Co., Inc. for the Pioneer-Flintkote Co. in Los Angeles. In building this structure (approximately 100,000 sq ft with 20 ft clear headroom) the Maag design, as well as his methods of purchasing and construction were utilized. The warehouse, which is 150 ft wide, is made of three 50 ft truss spans. The columns are spaced 20 ft apart (width of the bays) in the other direction. By using a jack truss 40 ft long, every other column can be eliminated, thereby increasing the transverse spacing to 40 ft. This, for example, is the spacing that the builders used in the Heinz warehouse at Tracy, Cal.

It should be pointed out that this new truss, roof and framing design in no way affects the type of wall structure nor building interior that may be used for any particular building. It was originally designed for one-story industrial buildings with a normal roof load. However, it has since been designed in everything from office buildings to factories requiring the strength necessary to carry heavy crane loads. Also, the design has worked equally well with all types of wall structures, (i.e., brick, tilt-up, concrete block or corrugated metal).

Fig. 7. Skeleton view of structural framing for Pomeroy-designed building. Note simplicity and lightness of framing and clear floor spaces for work or storage

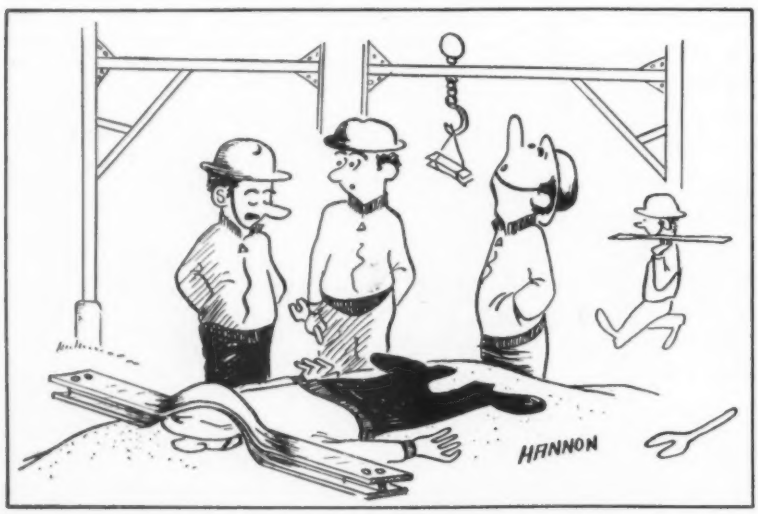
Its principal novelty lies in the new truss design and the extreme simplicity of the structural framing. The truss, as can be seen, is a combination of wood and steel. Since wood is best adapted when used in compression, and since steel is most efficient when subjected to tension stress, one, of course, achieves the greatest economy when these materials are used in this manner. These materials are thus effectively used in this new truss design.

Wooden top chord, which is in direct compression, also carries the roof joists in bending between the panel points in the truss. All vertical web members are thereby eliminated. The steel lower chord is in tension and is made in one continuous length without the necessity of splicing.

Diagonal members of the truss are all alike and interchangeable, having been designed to cut from standard 60 ft mill lengths without waste. All angles are punched in one leg only, which saves shop handling and labor.

The Maag standardized design brings about further steel economies because the fabricator is spared the expense of making shop drawings. Since there are only two kinds of angles and three sizes of plates, the structural details are so simple that they are made on one letter-size sheet. In fact, there are only six different types of pieces of steel in the entire structural frame. One is the column—the remaining five are in the truss.

Since all of the steels parts required in this design are standard stock items, they are purchased without the usual delay because the steel company does not need detailed drawings made and then have to wait for assembly time. The entire assembly of the truss is done by bolting with pneumatic impact wrenches right on the building site. By the use of a simple jig and since the individual truss members are easily handled by hand, this proved to be most economical.



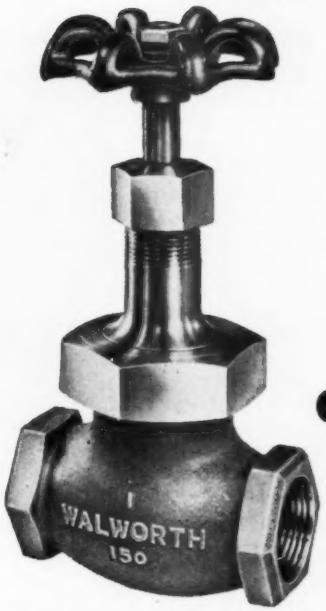
"Here, men, is a vivid portrayal of the value of hard hats."

WALWORTH

Toothed Lock Washer: Prevents loss of stem nut due to vibration, thereby holding the handwheel securely.

Newly Designed Handwheel: Air-cooled, finger grip handwheel affords sure grip even with greasy gloves.

Improved Packing: Molded packing of lubricated asbestos reinforced with copper wire. Suitable for practically every service. Valves can be repacked under pressure.



IMPROVED
No. 95
BRONZE
GLOBE VALVE

also available in Angle Type (No. 96)

The service ratings of the Walworth No. 95 are 150 pounds per square inch steam at 500F, and 300 pounds per square inch non-shock cold water, oil, and gas. In the manufacture of this quality bronze valve, more than 47 gages are used in machining parts to micrometric accuracy, thus insuring interchangeability of parts. For further information see your local Walworth distributor, or write: Walworth Company, 60 East 42nd St., New York 17, N. Y.

note these 7 Great Features

Hexagonal Union Bonnet Connection: Eliminates any chance of distortion or leakage even though valve is repeatedly taken apart and assembled.

WALWORTH
valves and fittings

60 EAST 42nd STREET NEW YORK 17, N. Y.

DISTRIBUTORS IN PRINCIPAL CENTERS THROUGHOUT THE WORLD

New Cylindrical Disc Holder: The design of the top portion of the disc holder keeps the disc accurately guided under all operating conditions.

Renewable Asbestos Disc: This disc is suitable for steam up to 500F and is resistant to oil, gasoline, and many chemicals at atmospheric temperatures. Discs for special services are available.

Extra Strong Body: Made of Composition M (ASTM B61) bronze thick enough to provide a high safety factor. Valves undergo hydrostatic shell test of 450 psi.

For more facts circle 573 on Reply Card

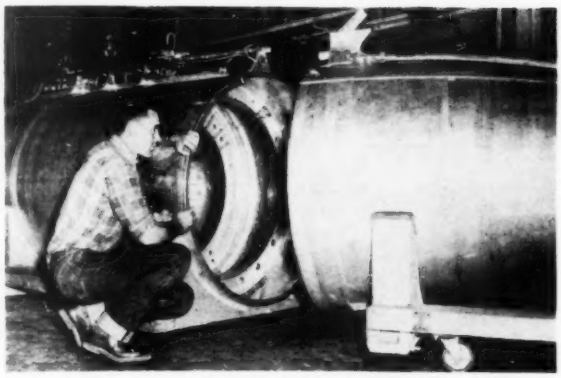
Gang Channel Nuts Solve Problem of Blind Mounting in Tank Joints

EXTERNAL AIRCRAFT FUEL TANKS, so big they are made in sections which are nested to save shipping and storage space, extend the flying range of Boeing's swept-wing B-47B jet bomber. Designed and built by Ryan Aeronautical Co., the tanks use Elastic Stop nuts in gang nut channels to reduce time and labor requirements for fabrication and assembly.

Gang nut channel strips are extensively used where assembly joints are located so that it is impractical to have a worker hold the nuts while the bolts are drawn up. In such cases, use of nuts pre-positioned in channels shaped to fit the joint contours means that attaching a channel automatically positions all its nuts.

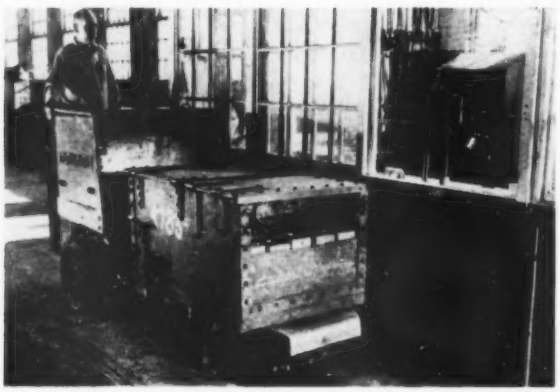
The tanks are made in three sections, each fabricated by resistance seam and spot welding. Joint flanges are inside the tank, and require blind mounting of the nuts.

Each joint is made with 36 nuts and bolts, and with gang nut channels used, each channel holds nine nuts and is shaped to cover one quarter of the flange circumference. Four rivets position the channels and hold them in place



while the nuts and bolts are drawn up. The channels are of high-strength anodized aluminum and use steel nuts with nylon inserts, made by Elastic Stop Nut Corp. of America.

Lift Truck Plays Important Role in Keeping Plant Scales Accurate



SCHEDULED ALMOST EXCLUSIVELY for service with the scale repair department, an electric lift truck shuttles among the 35 scales at the Buffalo, N. Y., plant of the American Brass Co.

To facilitate continual checking of the scales, on either a weekly or semi-weekly basis, a special skid box has been fabricated for transporting on the truck. This box, filled with a known total weight, is easily carried from one scale to another, lowered to the scale platform, and the scale reading noted. With some of the scales, the weights are removed from the box, and placed on the scale platform individually, for testing at increments of the total weight.

A standard platform truck, manufactured by the Automatic Transportation Co., Chicago, is used in the scale checking operation.

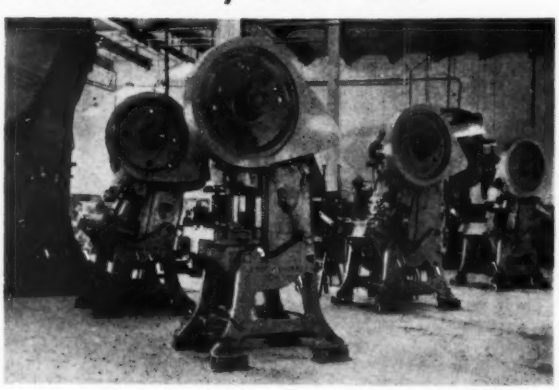
Vibration Isolators Solve Noise Problem, Provide Mobility as an "Extra"

MOBILITY of production equipment in a production area permits flexibility of operations that often means reduced costs and improved quality.

With presses ranging from 18 to 200 tons in capacity, the Wells Specialty Co., Inc., North Liberty, Indiana, found that it could rapidly rearrange the press line, and increase personnel efficiency, with each job order change that warranted the move.

The high speed presses created a serious vibration problem however, as they were moved to different spots. Floor cracks developed and repercussions increased from the plant neighbors, concerning the vibrations transmitted to their homes. Within the plant, the noise level was an additional problem.

Presses in the production areas were mounted on steel spring Vibro-Isolators, manufactured by Korfund, Inc., to provide vibrational control. The isolators were cemented to ⅛-in. thick felt pads, which in turn were cemented to the floor. Foundation bolts were thus eliminated and re-



arranging of the presses was simplified. Noise and vibration reduction have proven completely satisfactory.

Buy with confidence any machine

POWERED BY LELAND!

THE LELAND MOTOR supplied as original equipment on the machine or equipment you buy is your assurance that the manufacturer has not compromised with quality for the sake of cost. For Leland builds only *quality* motors...works hand-in-hand with manufacturers to provide standard or specially designed motors ideally suited to the specific application. The fact that the manufacturer has spared no expense to assure a dependable source of ample, smooth, quiet power for his product may well reflect a generally high degree of care and quality throughout.

Leland Type PA Polyphase Induction General Purpose Motor provides high starting torque for compressors and similar applications from 1/6 to 5 H.P.

The LELAND ELECTRIC Co.

DAYTON 1, OHIO

Division of AMERICAN MACHINE & FOUNDRY COMPANY, New York

In CANADA, Leland Electric Canada, Ltd., Guelph, Ontario

products are better... *by design*

For more facts circle 574 on Reply Card

Rubber Conveyor Belt Internally Reinforced with Steel Cable for Heavy Job

ONE OF THE WORLD'S few rubber conveyor belts reinforced internally with high tensile steel cables recently underwent its first trial run. With coal as cargo, the belt, made by B. F. Goodrich Co., completed the test at the Pennsylvania Railroad's new ore pier on the Delaware River near Philadelphia. In actual operation, the belt will handle iron ore brought in by ship.

The 93,000-lb, 54-in. wide belt extends for 1600 ft along a concrete pier and inshore to twin 600-ton capacity hoppers which will feed the ore into rail cars. On the last leg of the route, the belt climbs 80 ft in a distance of 445 ft, negotiating an incline of 16 deg.

To splice the belt on the site, Goodrich engineers used a new method, splicing the ends of the reinforcing cables after they were cut in a staggered pattern across the belt. Tubular connectors, installed at each cable splice, were lightly crimped to hold the ends in position, then after an equalizing strain was put on the belt, the connectors were tightened, holding each cable under equal tension.

Fabric and rubber covering, removed to make the splice, were replaced around the spliced cables, and the entire area was vulcanized with the belt under tension.

Miles of Metal Raceway Duct Service Industrial Lighting System

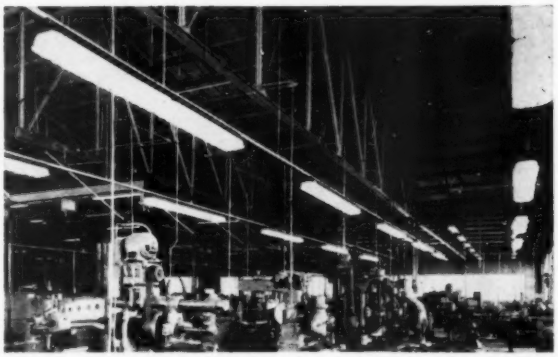
RECENTLY COMPLETED in a new building at New Orleans, Louisiana, a fluorescent lighting installation has a wiring system which answers the basic requirements of maximum efficiency and trouble-free operation.

The building, a one-floor plant measuring 440 ft by 200 ft, was constructed for the Edwin H. Fitler Co., manufacturers of twine and rope in sizes up to the largest in normal commercial and industrial use, and the lighting system is served by nearly two miles of Surfaceduct metal surface raceway.

A development of National Electric Products Corp., Surfaceduct is a raceway through which all types of service may be obtained, ranging up to 60 amperes.

At the Fitler building, the duct's base is suspended from the roof by means of steel straps fastened to fitted hangers. Conductors are laid in the base and wire-retaining bridges are snapped in. Capping is snapped over the base and locked in place by the retaining bridges.

Fluorescent fixtures are attached directly to the duct base, and taps from ballast leads are connected to conductors carried in the duct. No capping is used on the duct where the fixtures are attached. A steel strap is placed over the base of the duct and bolts from the trough of the fixture fasten the fixture to the duct through the strap.



Mobile Steam Service "Takes Over" During Emergency

CHICAGO'S DEPAUL UNIVERSITY boiler room fire afforded the Page Boiler Co. of Chicago, an opportunity to demonstrate its new mobile steam service.

With a brand new fleet of mobile steam generators ready to go into emergency service 24 hours a day, the boiler firm quickly supplied the steam needs of the huge educational institution just when it looked like the school would have to close down due to lack of power. Though confined to DePaul's boiler room, the fire caused damage sufficient to require major rehabilitation in that area.

Each truck in this new fleet is equipped with a steam generator providing from 15 to 100 hp quickly and efficiently. Full working pressure is claimed to be supplied in only five minutes' time. The unit is fully automatic and completely self-contained; steam is produced as needed, and the generator is ready to operate at a moment's notice.

ONE THING LEADS TO ANOTHER

Industry's Partner for Progress

J. F. Pritchard Co.
OF CALIFORNIA
A DIVISION OF J. F. PRITCHARD & CO.

Dept. 386, 210 West 10th St., Kansas City 5, Mo.

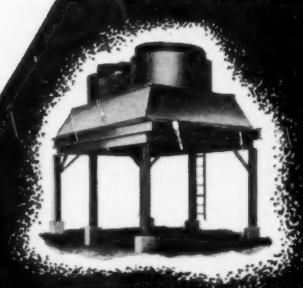
COOLING TOWERS
SPECIALIZED HEAT EXCHANGERS
GAS & AIR TREATING EQUIPMENT

Representatives in Principal Cities from Coast to Coast

Efficient production demands modern facilities. These facilities require top-performing equipment.

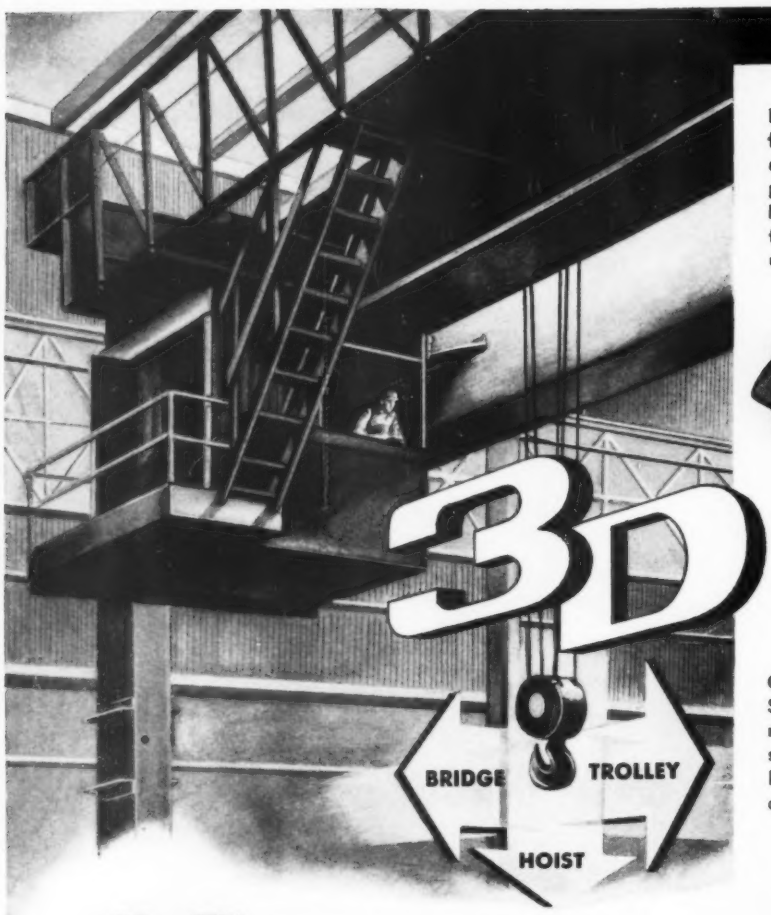
That's why your installation needs a superior cooling tower . . . like this heavy-duty Pritchard unit that cools the circulating water that cools the condensers that cool the generators in this modern power plant.

Hundreds of industrial power and process installations demonstrate the dependability of Pritchard to meet the exacting requirements of vital cooling operations anywhere along your production line.



You'll obtain maximum heat transfer . . . with maximum savings . . . in many process cooling operations from Pritchard QUINTAIR* heat exchangers. The induced draft design assures high efficiency with more even distribution of air over the coils carrying the product to be cooled or condensed.

*Registered Trade Name



3-Direction Control for Cranes is Our Specialty

For more than half a century, EC&M has led in the development of sturdy, highly efficient electrical equipment for cranes.

Designed into this equipment is that extra margin of safety and quality which insures uninterrupted service to the user... which also includes features helpful to maintenance men and operators, aiding them in their daily tasks.

Users recognize the symbol, (E&M) as a standard of value and specify this equipment whenever new cranes are purchased or when revamping existing installations. These users know that control, only a small part of the initial cost, is a vital part of every crane.

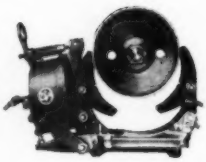
It pays to standardize on EC&M Control for cranes.

WRITE TODAY FOR BOOKLET 921

FOR A COMPLETE LINE OF CRANE CONTROL SPECIFY EC&M

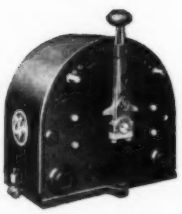
THE ELECTRIC CONTROLLER & MFG. CO.

2698 EAST 79th ST. • CLEVELAND 4, OHIO

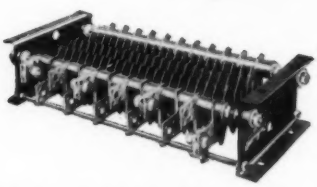


Long-Life Brakes for cranes operated by a-c or d-c power . . . give high speed performance with low upkeep.

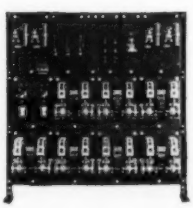
Youngstown Safety Limit Stops protect against overhoisting accidents . . . a positive check against human errors.



Cam-Type Master Switches have narrow width and short throw . . . less fatigue for the operator.



Tab-Weld Plate Resistors feature spot-welding that provides a continuous path and keeps resistance value constant.



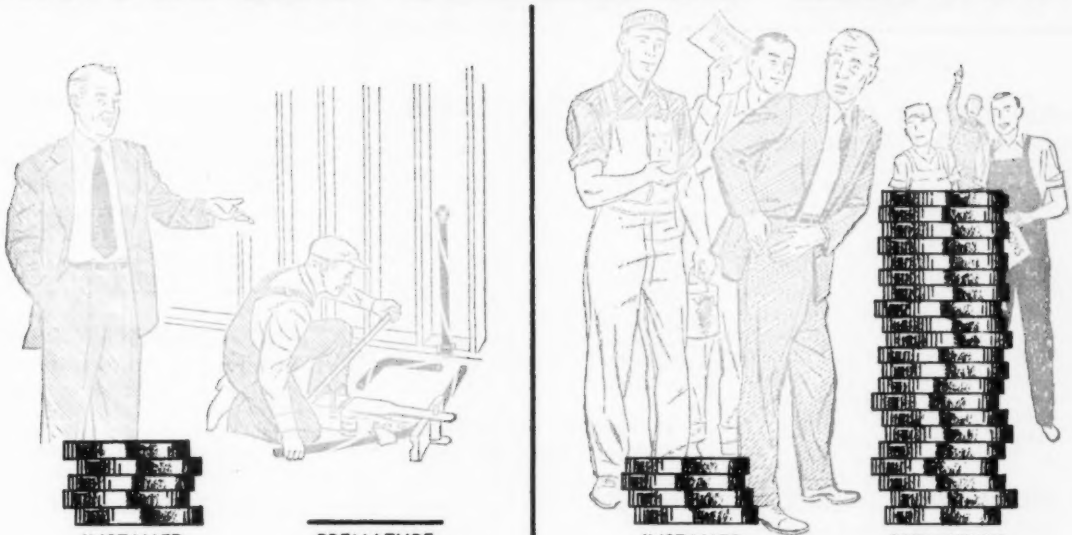
Reversing - Plugging Control for bridge and trolley motions . . . automatically controlled acceleration and only one adjustable relay for plugging.

Manual - Magnetic Disconnect Switches operate with ease . . . are arranged to control crane lights also.

3770

For more facts circle 579 on Reply Card

WHICH WILL IT BE...



a little more NOW—or a lot more LATER?

Let's take a close look at this so-called higher cost of wrought iron pipe.

All too often, INITIAL COSTS are used as the only basis of comparison. The fallacy of the initial-cost-yardstick has been proved time and time again in installations where low-first-cost piping has been installed and has failed prematurely. The original installation was quickly made by pipe fitters. But repairs call for hours of work by as many as five craftsmen—pipe fitters, masons, carpenters, plasterers, painters. And labor costs are only part of the picture. The indirect costs of production slowdowns and disrupted routine swell the total of every premature pipe failure. It's easy to see how this first failure can wipe out initial "savings" many times over.

The only *valid comparison* of piping costs is INSTALLED COSTS *plus* REPAIRS. This yardstick places the emphasis where it rightly belongs . . . on SERVICE LIFE. In installation after installation, wrought iron pipe has doubled, tripled and even quadrupled the useful service life previously obtained from low-first-cost piping. All this adds up to one thing . . . the fact that you pay a little more for wrought iron means that you pay a LOT LESS FOR MAINTENANCE. Wrought iron gives you *piping economy,* because it lasts longer, at lower cost per year!

If you are concerned about piping services where corrosion is a threat to durability, you'll find it profitable to investigate the longer life of wrought iron pipe. Our Engineering Service Department will be happy to send you examples of typical wrought iron service records in installations similar to those in which you are interested. Write or call.

A. M. Byers Company, Pittsburgh, Pa. Established 1864. Boston, New York, Philadelphia, Washington, Atlanta, Chicago, St. Louis, Houston, San Francisco. Export Department: New York, N.Y.

Why Genuine Wrought Iron Lasts

This notch-fracture test specimen illustrates the unique fibrous structure of wrought iron—which is responsible for the high corrosion resistance of the material. Tiny threads of glasslike silicate slag, distributed through the body of high-purity iron, halt and disperse corrosive attack, and discourage pitting and penetration. They also anchor the initial protective scale, which shields the underlying metal.

BYERS

CORROSION COSTS YOU MORE THAN WROUGHT IRON

WROUGHT IRON

TUBULAR AND HOT ROLLED PRODUCTS

ELECTRIC FURNACE QUALITY ALLOY AND STAINLESS STEEL PRODUCTS

For more facts circle 576 on Reply Card

NEW PRODUCTS & PROCESSES

summarized for your convenience

Edited by M. E. Heniken

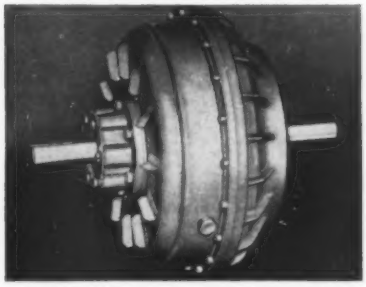
1—FLUORESCENT LAMP with extra high light output

A new rapid-start fluorescent lamp, said to produce higher light output than any existing lamps without sacrificing life, will soon be available in limited quantities in 96-in. length 1½-in. dia. A 72-in. lamp will follow later. Manufacturer points out that reduction of original and maintenance costs, and ability to operate at low atmospheric temperatures make this lamp practical industrially, for both inside and out-of-door locations. The lamp features a new base, incorporating two recessed contacts in a single element, and providing convenient push-pull lamp insertion. Lamp Div., General Electric Co.

2—AUTOMATIC CONTROL for tensioning and winding

An improved Hydro-Wynd is said to offer automatic winding and tensioning control at low initial cost and without unnecessary bulk or expensive maintenance. Featuring improved construction plus larger capacity the new Hydro-Wynd is available in the Models 12.2 and 8.4. Improved features include rearrangement of gear train, better bearing spacing.

Operating principle is similar to that of company's previous models. The Hydro-Wynd has a fluid coupling and planetary gear set. The ring gear is connected to the impeller, or pump, of the fluid coupling. The plant gear carrier is fixed to the turbine, or runner, of the fluid coupling, and the sun gear is integral with the output shaft. To mastermind the operation, the automatic "slip" of the fluid coupling reacts with the planetary gear set—transmitting increased torque to maintain tension, while the roll rpm decreases and the roll diameter increases. Twin Disc Clutch Co.



3—MOTOR STARTER provides three-coil protection

For applications in which two-coil overload protection is not enough for industrial motors, this starter is designed to offer three-coil overload protection in the same enclosure and at little extra cost. An additional feature is its adjustable heater coil. You can get four different ratings from a single coil by merely changing its position, manufacturer points out, and you get motor protection within 3 per cent of usable motor load. This is said to result in more exact protection, less nuisance tripping and more usable horsepower for new or old motors. An example in which three-coil protection is suggested is on wye-delta systems where an open phase in the primary of the transformer results in one high and two low currents. If only two lines are protected, the high current line may be the one that is unprotected. Cutler-Hammer, Inc.

4—THIN WALL TUBING of high strength stainless steel

This high strength, thin wall stainless steel tubing is offered for use where corrosion resistance, light weight and special shapes or bends may be required. The manufacturer also will engineer special applications of this tubing in combination with fittings and its own flexible tubing or expansion joints. Further data and prices are available. Flexonics Corp.

5—CORES, high permeability, for torroidal windings

Permeron nickel-iron cores for torroidal windings are announced as available. Originally developed to provide a high permeability core for the saturable reactor on this manufacturer's mechanical rectifiers, production now permits marketing a wide range of sizes, up to 20 in. OD, for other applications.

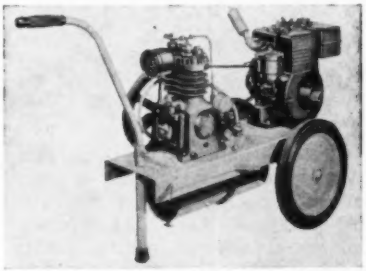
Steep hysteresis curves are said to indicate rapid, maximum flux change from negative to positive saturation, within a small magnetizing current range. Permeron cores have applications in magnetic amplifiers, transductors, impulse transformers, computer flipflops, magnetic blocking devices, and other uses where high-permeability rectangular-loop cores are needed. I-T-E Circuit Breaker Co.

More information on any of these products can be yours without cost or obligation. Just circle the item numbers on the Reader Service Cards on pages 35-36 and 119-120.

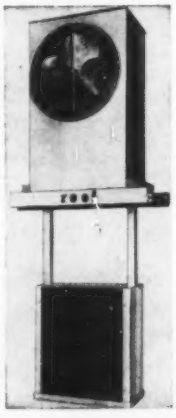
7—AIR COMPRESSORS for painting, general utility use

A new line of portable air compressors includes a variety of models. One of them, designed especially for spray painting is a 1-hp model rated at 60 lb maximum pressure and delivering 5.4 cfm. For general utility there are ½- and 1-hp compressors, both with 100-lb maximum pressure rating. The 1-hp unit delivers 4.2 cfm and the ½-hp model has an output of 1.91 cfm. All compressors are available with electric or gasoline motor.

In these units the compressor and motor are mounted on a sturdy chassis having two large wheels with rubber tires. A handle for guiding the unit can be removed for transporting the compressor in a passenger car. Design features incorporated include automatic oiling by a ring-type oil pickup and centrifugal force, and deep directional fins for uniform cooling. The De Vilbiss Co.



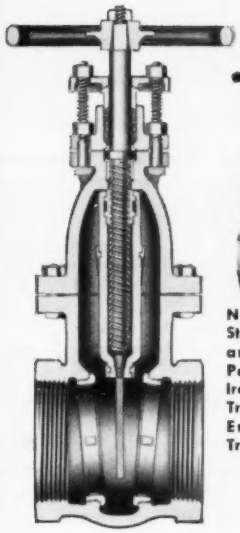
6—ROOF UNIT, 2-ton capacity, for low cost "spot cooling"



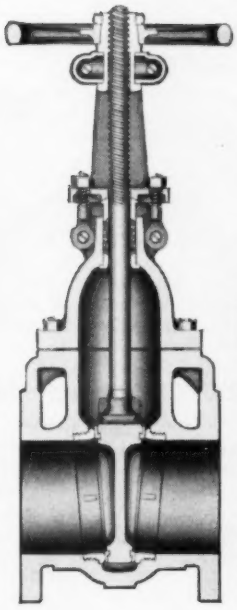
Used singly or in multiples, as required, this mechanized self-contained roof unit is designed for flexible and low cost air conditioning. Units can be centered in a plant's "hot spots" to cool and clean the air at ceiling level, to maintain uniform temperatures in working areas. They are adapted to one-story structures and the top floor of multiple story buildings.

Called the "big brother" of window air conditioning units, this 2-ton capacity one can be installed in any type of roof, it is pointed out, and by a plant's own maintenance crew. It is placed in a prepared opening and connected to electric power. There are no refrigerating connections to make, and no water drain is required—condensate water is elevated and evaporated to outer air. The 2 hp Freon compressor and condenser are mounted on the roof, as shown. Refrigerant circulated through the supporting stanchions to evaporators hanging below the roof. Cooling is accomplished by means of a fan blowing over the suspended aluminum evaporator coil. Neat in appearance, this hanging unit cooler has a galvanized steel supporting frame, aluminum exterior and interior casing. Kritzer Products.

Crane 125-Pound Iron Body Wedge Gate Valves are an improved design, embodying many features of unusual merit. They set a new peak for quality in iron body wedge gate valves, having greater strength, longer life, and better all-round adaptability for all types of services.



Non-Rising Stem; Screwed and Flanged Patterns; All-Iron or Brass Trimmed. Hub Ends, Brass Trimmed only.



Outside Screw and Yoke; Screwed and Flanged Patterns; All-Iron or Brass Trimmed. Also available with brass seats and steel stem.

See If You Don't Agree!

Here's the big value—the big selection: CRANE 125-Pound Iron Body Wedge Gates

. . . with quality features that assure exactly the kind of service you want. Body and bonnet are oval-shaped with extra metal where it's needed most, to provide liberal strength. Flanged patterns have tie-ribs between body and bonnet flanges. You also get a solid web-type disc with long guides . . . a stem of liberal diameter with long thread engagement . . . an exceptionally deep stuffing box with high-grade packing . . . a two-piece ball-type gland and flange—plus an easy-to-grip handwheel with oval-shaped rim. Non-rising stem valves have a brass bushed stem collar. OS&Y design includes a brass bonnet bushing, swinging eye bolts . . . and a tee-head disc-stem connection on sizes 12-inch and smaller.

Big selection includes all-iron or brass trimmed valves . . . Underwriters' pattern valves, quick-opening types . . . valves for process industries . . . valves for marine service. Sizes up to 48-inch. Check your Crane Catalog or ask your Crane Representative next time he calls.

THE BETTER QUALITY . . . BIGGER VALUE LINE . . . IN BRASS, STEEL, IRON

CRANE VALVES

CRANE CO., *General Offices:* 836 S. Michigan Ave., Chicago 5, Illinois
Branches and Wholesalers Serving All Industrial Areas

VALVES • FITTINGS • PIPE • PLUMBING • HEATING

For more facts circle 577 on Reply Card

NEW PRODUCTS

(Begins on page 156)

8—FIRE-RESISTIVE MASTIC for hazardous locations

Type 80 Mastic is described as an unusual anti-corrodant, a vapor barrier, a weather protective coating with "built-up film thickness." According to manufacturer, it is the first weather protective coating to be listed by Underwriters' Laboratories with the fire hazard classification. It is applied by spray, glove or trowel over storage tanks, pipes, valves, fittings, thermal insulation and structural metals. Technical data, index to mastic and finish coat specifications are available. Benjamin Foster Co.

9—ELECTRIC TRUCK can be used in restricted space

An electric fork truck which operates in a 7-ft aisle and can pick up and deposit loads without straddling pallets or skids is announced. Called the Warehouser Extend-A-Load, it has 2000-lb capacity at 24-in. load center. Capable of short radius turns, it is designed to reach out and pick up or deposit a load at any height from floor level to 126 in. The fork spread adjusts from 12 to 26½ in.

Loads are extended and retracted by a hydraulically powered pantograph device actuated by two double acting cylinders operated by pushbutton. Controls used to hoist, lower, control travel direction and accelerate truck are grouped for one-hand operation. The Yale & Towne Mfg. Co.

10—SPROCKET PULLERS for industrial tractor use

This new sprocket puller is designed to fit Allis-Chalmers, International-Harvester and Caterpillar industrial tractors. It is powered by company's OTC 50-Ton Power Twin-Hydraulic Ram, and this one basic unit with available attachments is said to remove the drive sprockets quickly and with little effort. The pullers are designed for one-man operation. Three types of pumps are available to activate the ram—a single speed hand pump, a three speed hand pump, and an electrically driven pump, all of which operate at 10,000 psi. It is pointed out that plants already having the OTC 50-Ton Ram need order only the sprocket pullling and installing group. Owatonna Tool Co.

11—RAIL SKIDS for general yard storage of heavy materials

To simplify yard storage of steel pipe, tubing and beams, this supplier of rails has developed a sturdy, high load capacity skid that is easily moved from place to place. The skid consists of railroad rail, cut to length, and precast concrete supports with anchor bolts cast in place. To assemble a skid, the concrete supports are spaced at desired intervals, and then the rail is bolted to the supports and anchored with clips. This assembly is said to make for firm, rigid construction.

An important advantage of this skid is that it can be quickly disassembled and moved together or farther apart or can be moved from place to place to suit the job. In wet weather, or in filled ground, the skid can be moved and low spots raised to ground level. The Foster Co.

12—INTAKE AIR FILTER of rayon flocked screen wire

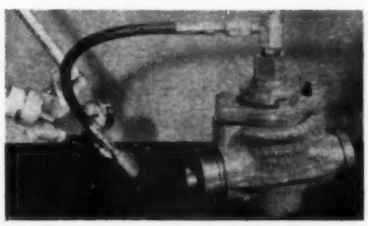
The Type FS Intake Air Filter for small portable or stationary engines and compressors uses rayon flocked screen wire as the filtering medium—the material used for combat plane carburetor intake filters. The flock is bonded to the 14-mesh galvanized screen wire with a thermo plastic bond, designed to resist gasoline or other solvents and permit many cleaning methods.

The filter may be operated either dry or oil coated, and when oiled, the dust holding capacity is claimed to be comparable to that of a viscous type filter. An inner perforated screen baffle serves to equalize the air flow and protect against backfire. The Type FS comes in seven sizes, giving a capacity range from 50 to 800 cfm. A weather shield is available for outdoor installation. More information is presented in Bulletin 135. American Air Filter Co.

13—WIRE with moisture-resistant outer braid

Triple Knit Weatherproof Wire comes in Sizes 14 through 4 awg, put up in a 500-ft coil package. The Fiberglas outer braid is inherently resistant to moisture, heat, chemical action, and abrasion, it is explained. Not only do the glass fibers resist the absorption of moisture, but they also do not serve as "channels" which conduct moisture beneath the surface. Laboratory tests are reported to show that this wire picks up as much as 50 per cent less moisture than cotton-knit wire of the same type.

The glass yarns are claimed to have a tensile strength several times higher than comparable organic fibers, and to retain that strength indefinitely. The fibers are not affected by oils, are resistant to many chemicals. This makes the braid a durable support for asphalt coatings, manufacturer points out, and is advantageous in locations where chemical vapors are prevalent. Rome Cable Corp.



14—BUTTON HEAD COUPLER is valve lubrication aid

This button head coupler, the "400," is offered for use with company's pressure lubricant hand guns and bucket pumps. Most important feature of this large coupler is a positive shut-off device to stop extrusion of lubricant from the coupler immediately after removal from fitting. Coupler has ¼-in. pipe thread connections. Rockwell Mfg. Co.

15—VOLT-AMMETER offers automatic scale changing

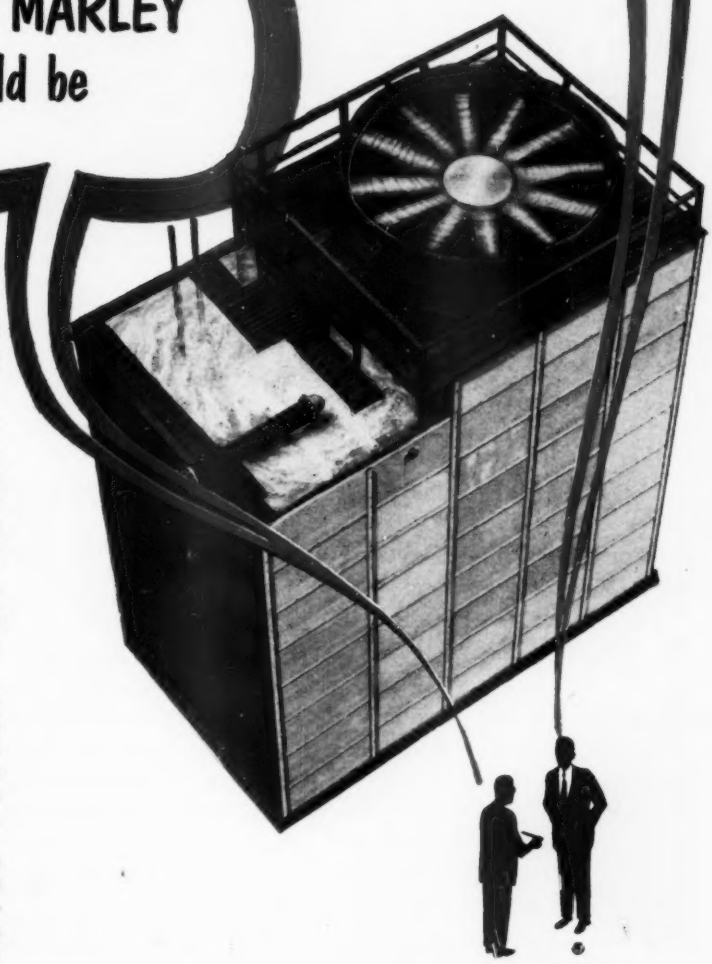
A pocket-size hook-on volt-ammeter, the AK-5, is believed to be the first with automatic scale changing. The unit is designed for quick and accurate current and voltage measurement, with the scale

changer eliminating the possibility of reading the wrong scale for the application. It aids in balancing circuits, tracing faults and grounds, estimating distribution circuits and diagnosing troubles.

The unit has a current range of 5/20/-80/350 amp, embracing extent of currents normally encountered in industrial circuits. It is designed to measure a-c voltage

What's the temperature of the basin water?

84°— just what MARLEY said it would be



Thermal control dictates the economy of every process operation, and the key to control is cold water — delivered consistently at design specification. Every Marley cooling tower offered today will produce that optimum result.

Built into every Marley tower is the pretested performance ability to do its specified job (or more) day-after-day, year-in-year-out. This is the result of 30 years of constant research and development; the result of 10,000 separate installations of Marley mechanical draft cooling towers. Today Marley has positive performance data for every tower for any location and Marley backs its knowledge with an equally positive guarantee.

Test after test have proved the efficiency of Marley rating methods. These tests have been conducted according to procedure specified by all accepted test codes. The Marley tower you purchase is subject to the same complete test after installation.

"Calculating Cooling Tower Performance from Test Data," a new Marley brochure explaining a simplified method of analyzing the actual performance of any type mechanical draft cooling tower will be available soon. May we have your name for an advance copy?

The Marley Company

Kansas City, Missouri

MARLEY

For more facts circle 578 on Reply Card

"All day I watch the coal go by!"

"Train after train. Day and night. Year after year. You wonder where it all comes from and how long it can last."

• • • • • • • •

You're right, Pop, it's a lot of coal – close to half a billion tons a year. Yet, in the more than a century this country has been mining coal, we have used up only a little over one percent of our known supply. 98.8% of the coal that nature put under our soil is still there for future generations.

That is something to think about when you are considering a new heating plant for home or industry. Other fuels will be getting scarce. Every year the wells go deeper. More and more of our fuel oil comes from foreign fields. Growing scarcity can mean uncertain supply and higher relative prices.

Coal you can be sure of. There will be a plentiful supply for many centuries to come. And the price advantage that makes coal a most economical fuel today is likely to grow with every passing year.

Bring your fuel problems to C&O

As the world's largest carrier of bituminous coal, the C&O is intimately familiar with every phase of coal use. We have a large staff of experts who will gladly help you to locate the coal best suited to your needs; to help you use it most efficiently; to help get it to you promptly.

Write to:
Coal Traffic Department
Chesapeake and Ohio Railway
2111 Terminal Tower
Cleveland 1, Ohio

COAL
FUEL OF THE FUTURE

Chesapeake and Ohio Railway

For more facts circle 658 on Reply Card

WEIGHS 28 LB

LIFTS 1,000!

KELLER AIR HOISTS

Lightness in weight is an advantage you get when you LIFT WITH AIR. One man easily carries a Keller Air Hoist up a ladder and hangs it . . . thus it is easy to move from place to place in the shop, and to service.

POSITIVE CONTROL OF THE LOAD—The Keller Air Hoist operates with an air valve, so it has an infinite number of speeds from the merest "nudge" to 17 fpm. Spotting is easy and accurate with the positive displacement motor and mechanical brake that locks the load in place.

LOWER MAINTENANCE COSTS—An air motor cannot burn out—from overload, stalling, continuous use, or too frequent reversals. Thus the use of air hoists usually brings a substantial reduction in down time and expense.

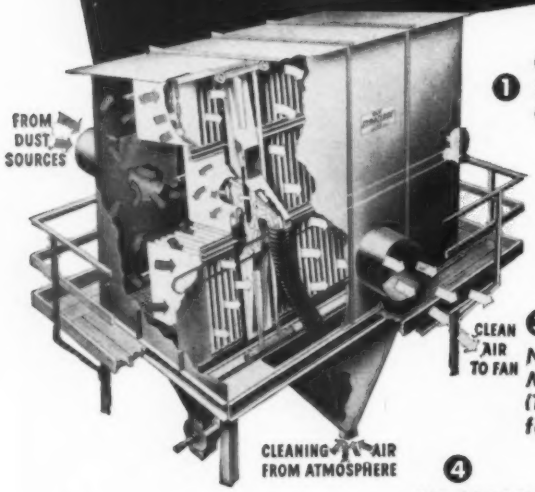
Available in 3 capacities—300, 1,000, and 2,000 lb. For full information, ask for Catalog Section 86.

KELLER TOOL COMPANY

1327 Fulton St., Grand Haven, Mich.

For more facts circle 580 on Reply Card

THE
DYNACLONE®
PATENTED
The ULTIMATE in Dust Filters



1 CONSTANT SUCTION at dust sources.

2 SELF CLEANING for continuous operation.

3 NO AUXILIARY MOTORS or BLOWERS (The main operating fan does the cleaning).

4 NO ABRASION of BAGS by the CLEANER.

5 LESS OVERALL HEIGHT and FLOOR SPACE.

HOW IT OPERATES

(a) Dust laden air is drawn in from the dust sources as indicated by the shaded arrows.

(b) It is diffused into the dust chamber by the baffle plate.

(c) It is then drawn through the fabric of the filter bags and is cleaned as shown by the clear arrows.

(d) Clean air passes out of the case and goes to the suction fan.

(e) Concurrently, the traveler moves back and forth across the dust wall registering successively with one bag at a time.

(f) The suction which exists in the dust chamber draws a blast of atmosphereic air through the bag in reverse directions and cleans that bag. (No shaking.)

Control your industrial dust better, for less — with the Sly Dynaclone. May we explain how?

SEND FOR BULLETIN NO. 102

THE W. W. SLY MANUFACTURING CO.
4600 TRAIN AVENUE • CLEVELAND 2, OHIO
New York • Chicago • Philadelphia • Syracuse • Detroit • Buffalo
Cincinnati • St. Louis • Minneapolis • Birmingham • Los Angeles • Toronto

SLY PIONEERS & LEADERS in INDUSTRIAL DUST CONTROL

For more facts circle 581 on Reply Card

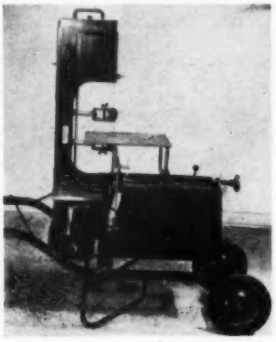
NEW PRODUCTS

(Begins on page 156)

in three ranges (150/300/750) without auxiliary equipment, provide accuracy up to 3 per cent of full scale, and withstand a voltage breakdown test of 4000 v a-c. It clamps around any conductor up to 2 in. diameter, and its contoured trigger closes and opens the hook-on assembly, which is covered with insulation to help safeguard against grounding or short-circuiting. Desired range and scale is obtained by turning the unit's switch knob. Current scales are marked in black; voltage scales, in red for easy reading. The 1¼-lb device is shock-resistant, has screw-in voltage leads. General Electric Co.

16—BAND SAW is versatile metal-cutting tool

The Mighty Midget is declared ideal for machine, electrical, welding, and maintenance work. It consists of three saws in one unit—to use in a horizontal "jacknife" style, as an upright table saw, and in cutting angles up to 45 deg. Manufacturer says the Mighty Midget is readily



convertible to any of its uses without need for a wrench or square to set it up. Also its cutting carriage can be adjusted sideways by means of a knob, to facilitate fine placement of blade with reference to the cut-off mark. The saw has a capacity of 6 in. by 8 in.; it weighs 205 lb. It is announced as a popular priced unit, easily moved about the shop or taken by truck to the job. Dutch Stark Co.

17—COMPOUND CARRIAGE extends lift truck height

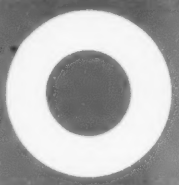
A compound carriage for use with manufacturer's Spacemaster Electric Fork Lift trucks adds 14 in. extra lift—with no increase in the collapsed height of the truck. For example, where collapsed height is 83 in., the usual fork elevation is 127 in. With this device, forks may be elevated to 141 in., while capacity remains approximately the same with only a 3-in. extension of load center.

The compound carriage consists of an extra short mast section and an extra carriage, the short mast section welded to the normal lifting carriage, while the extra carriage containing the forks rides within the new mast section on rollers.

Cents per lb. for Bearing Bronzes Isn't the Whole Story...

IF YOU BUY A ROUGH-CAST BAR . . .

to make this

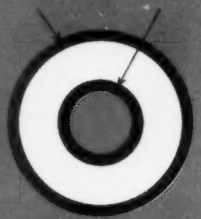


1" I.D. x 2" O.D.
Weight: 9.0 lbs./ft.

you get this

¾" I.D. x 2¼" O.D.
Weight: 13.5 lbs./ft.

note the scrap loss



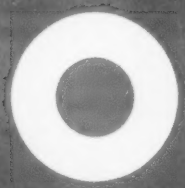
4.5 lbs./ft. lost!

BUT IF YOU BUY ASARCON 773 . . .

to make this

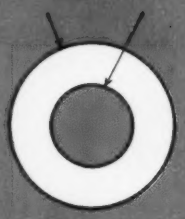
1" I.D. x 2" O.D.
Weight: 9.0 lbs./ft.

you get this



31/32" I.D. x 2-1/32" O.D.
Weight: 9.7 lbs./ft.

almost no scrap!



Only 0.7 lbs./ft. lost!

Thus far only the SIZE (diameter) of the bronze has been considered. ALSO, with Asarcon 773 you are able to buy exactly the length you need, short or up to 105" long. You get no costly short-ends! More dollars saved . . . no remnants!

In addition, Asarcon 773 (SAE 630) stock bronze has no blow-holes, no pits and no shrinks. The patented continuous casting process by which it is made uses no sand; there are no inclusions in the metal to damage tools. Properties are far superior to those of the similar sand-cast or permanent mold-cast alloys.

Asarcon 773 is available in 216 sizes — tubes and solids — from the stocks of distributors in principal cities. Continuous-Cast Bronze is also made to order in a wide variety of other alloys, in rounds and other shapes . . . up to 20' in length.
Use coupon below for NEW bulletin giving details.

ASARCO
CONTINUOUS-CAST
RODS · TUBES · SHAPES

AMERICAN SMELTING AND REFINING COMPANY
Perth Amboy Plant, Barber, N. J. • Whiting, Ind.
West Coast Sales Agent
Kingwell Bros. Ltd., 457 Minna St., San Francisco
In Canada
Federated Metals, Canada, Ltd., Toronto and Montreal

AMERICAN SMELTING AND REFINING COMPANY
Perth Amboy Plant, Barber, New Jersey

- ☐ Please send new brochure on Asarcon 773 stock bearing bronze
- ☐ Send literature on other Continuous-Cast Bronzes
- ☐ Send a salesman

Name _____ Title _____

Company _____

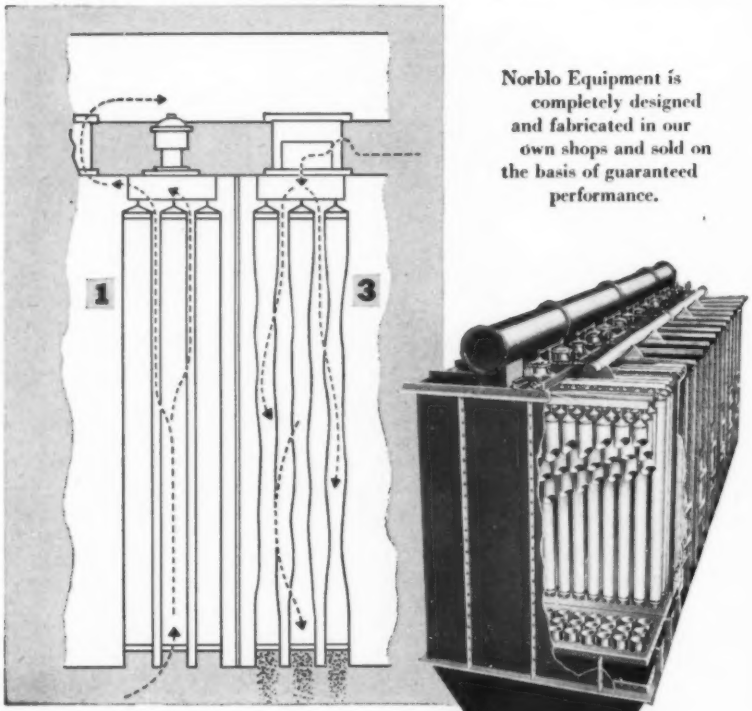
Address _____

City _____ Zone _____ State _____

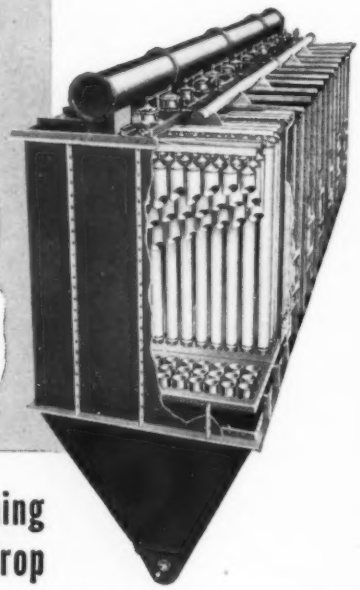
For more facts circle 582 on Reply Card

Norblo

gives you 24 hour-a-day DUST COLLECTION at full rated capacity



Norblo Equipment is completely designed and fabricated in our own shops and sold on the basis of guaranteed performance.



Double-action bag cleaning ... Constant suction drop

Norblo Automatic Bag Type Dust Collectors have proved the soundness of these operating principles for over 25 years:

1. Basic unit compartment houses 78 cylindrical bags, fully distended by upward inside air flow.

2. Variable cleaning cycle timing, adjusted to dust load, insures constant volume of air handled and constant pressure drop across arrester.

3. Shaking and cleaning involves only one compartment at a time. During short vigorous reciprocating shaking period, reversed air flow insures cleaning of bags but in no way interrupts suction drop.

4. Any compartment may be cut out alone, for bag repair.

Write for Bulletin 164-3 giving full description.

The Northern Blower Company

Engineered Dust Collection Systems for All Industries

6423 Barberton Ave. OLympic 1-1300 Cleveland 3, Ohio

For more facts circle 583 on Reply Card

NEW PRODUCTS

(Begins on page 156)

At the start of the lifting cycle, the center ram first lifts the extra carriage and forks to the top of the new mast section —then center and outboard rams continue to rise, lifting the forks to a height of 141 in. Lewis-Shepard Products, Inc.

18—CONSTRUCTION SYSTEM for the smaller buildings

Flowstrut, a system for quick erection of warehouses, garages, sheds, etc., is said to let the user proceed directly, without skilled labor, from rough sketch to completed structure. A wrench and cutter are the only tools needed. Basic components are slotted steel angles of 14-gage steel, which can be bolted together in

many combinations. The angles, supplied in 12-ft lengths, are pre-drilled with 40 bolt holes per foot and marked for cutting at ¾-in. intervals. It is pointed out that while single angles are strong enough to support most loads, two or more angles can be joined to form compound beams.

For surface areas, 20-gage steel panels are bolted directly to the angles. These come in 9- and 12-ft depths, 36- and 48-in. lengths, and can be reinforced when necessary, with panel stiffeners. The latter can be added to the Flowstrut structure during or after construction for support of panels when abnormal loads are to be carried. Company says Flowstrut components are bonderized with a weather-resistant gray enamel finish, are corrosion proof, require no further treatment before use. Flowstrut can be used alone, or with plywood, corrugated iron, asbestos, other materials. It is re-usable —a structure can be dismantled and assembled later. Flowstrut Corp.

19—ABRASIVE MATERIAL for sanding operations

Sand Screen, a nonclogging open-mesh abrasive material, designed especially for sanding operations where loading or glazing is a problem, is available in a variety of shapes and sizes. It is reported to give 7 to 15 times longer life than many coated abrasives. This new screen-like abrasive is coated uniformly on both sides with silicon carbide grain. Its open-mesh construction reduces loading by permitting sanding residue to flow freely

New G-E Electronic Relay: Highly Sensitive to Resistance Changes

SPECIFICATIONS

HIGHLY SENSITIVE

Even a wet thread will provide enough signal to operate this relay.

TWO TYPES OF OPERATION

Relay can be set for either "normal" operation (relay "drops-out" when external resistance is decreased to a value between zero and four megohms*) or "reversed" operation (relay "picks-up" when external resistance is decreased to a value between zero and two megohms*).

*Depending on dial setting.

DIAL ADJUSTMENT

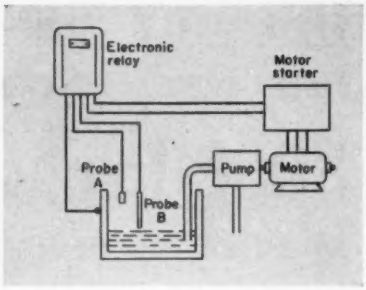
Sensitivity level set by adjusting dial, which can be locked in place. Relay may be remote controlled from as far away as 500 feet.

CONSTRUCTION

Enclosure is weather-resistant and dust-tight (NEMA Type III and V).

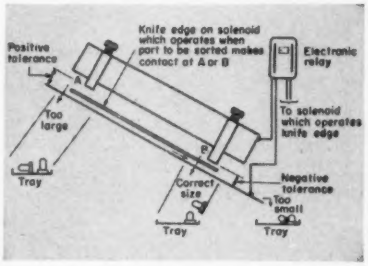
Can Be Used for Liquid-Level Control

This new electronic resistance-sensitive relay can control liquids between two predetermined levels. Relay will start a pump when liquid-level reaches probe A, will continue pumping until liquid falls below probe B. Then it shuts itself off until liquid again reaches probe A. This operation can be reversed to keep the tank full.



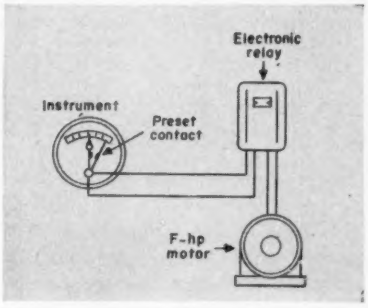
Can Be Used for Sorting Small Parts

Oversize parts touch contact "A," closing electronic relay input circuit. This relay energizes solenoid which directs part into a container for oversize parts. Point of contact "B" is set at standard height less tolerance. Parts touching this contact point are acceptable and are "shot" down another chute. Undersize assemblies do not touch either point and slide to a third tray.



Can Operate from Contact-Making Instruments

The G-E electronic resistance-sensitive relay is able to amplify even the minute currents carried by the delicate contacts of contact-making instruments. For instance, the relay can be arranged so that it will start or stop a f-hp motor directly when an ammeter, voltmeter, or wattmeter reaches the required meter reading.



PHOTOELECTRIC RELAY CR7505-K100

One of a complete line of devices for all photoelectric applications. Inexpensive, has broad application. Bulletin GEA-3533D.

ELECTRONIC TIMER CR7504-A142

Handles timing over three ranges, .06-1.2, .6-12, 6-120 seconds. Highly accurate, versatile. Bulletin GEA-5255B.

FOR MORE INFORMATION, contact your nearest G-E Apparatus Sales Office or authorized G-E distributor, or write General Electric Company, Section J 785-4, Schenectady 5, New York, for the following bulletins:

- ☐ Electronic-Resistance-Sensitive Relay, GEA-5893
- ☐ Photoelectric Relay, GEA-3533D
- ☐ Electronic Timer, GEA-5255B

NAME..... TITLE.....

COMPANY.....

ADDRESS.....

CITY..... STATE.....

ELECTRONIC DEVICES

GENERAL ELECTRIC

For more facts circle 584 on Reply Card

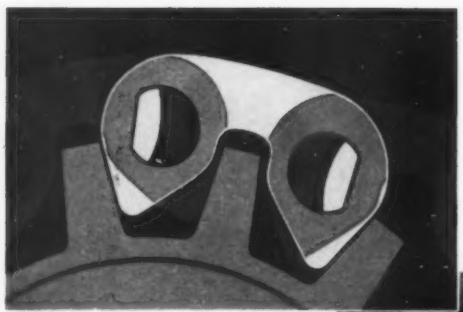
RAMSEY

with the most unique (and imitated) chain joint in the Industry

the only silent chain drive

that enables chain speeds up to

8000 fpm, with no special means of lubrication



The dependable and proven Roller Bearing Compensating Joint. Designed by **Ramsey** to reduce chordal action and permit high speed operation. Note its **line contact** between the flat surface of the link and the flat surface of the tooth. Link rolls smoothly into position on tooth, eliminating heat, noise, vibration.

An unretouched photograph of a typical Ramsey Drive. At high speed note its smoothness and lack of vibration. Only the Ramsey joint allows the chain links to follow such a true path tangent to the pitch diameter of the sprocket.

The revolutionary Ramsey chain joint design, first announced in 1923, immediately made possible unprecedented high speeds. Today Ramsey chain drive is still the leader where high speed transmission and small driving sprockets are essential.

The *rolling action* of the Ramsey joint cuts out noise, vibration, friction, heat, and wear. Its large size permits the greatest degree of articulation, which in turn permits use with extremely small pinions — in some cases as small as 15 teeth, further enabling ratios as small as 10 to 1 in limited space.

All this without oil pump, slingers, or anything beyond a simple drip feed oil cup.

Driving pinion speeds go up to 6000 rpm for ⅜ pitch chain . . . 4000 for ½ pitch, 3600 for ⅝ and ¾ pitch . . . 2800 for 1 pitch . . . 1400 for 1½ pitch.

To secure all the advantages of a long-lived, vibrationless, truly high-speed chain drive, select RAMSEY. See your Mill Supply house or write us direct for the latest catalog and application manual.

SILENT CHAIN DRIVES – FLEXIBLE COUPLINGS

RAMSEY

CHAIN COMPANY, INC.

5154 BROADWAY • ALBANY, N. Y.

For more facts circle 585 on Reply Card

NEW PRODUCTS

(Begins on page 156)

through the numerous openings, and also lets material be used on both sides.

Sand Screen can be used wet or dry, for both machine and hand sanding operations. It comes in full sheets, cut sheets and discs, in grit sizes of 180 and finer; it can also be furnished in 50 yard rolls up to 18-in. wide. The material can be used flat or folded; it can be creased and torn. A brochure and sample are offered. The Carborundum Co.

Use the Reader Service Cards on pages 35-36 and 119-120 to ask for more information on these products. Circle item number of products in which you are interested.

20—MASKING TAPE does the specialized taping jobs

Permacel 721 is a new low-tack flatback masking tape for use in specialized operations and on jobs that demand easy removal from work. It was developed for use in masking over gold leaf where low adhesion is required to avoid removal of the gold leaf when the tape is peeled off. In this application Permacel was reported so successful that it is now manufactured as one of company's standard tapes. Because of its unusual adhesive characteristics and thinness of adhesive layer, this tape is suggested for stencilling, as a drafting tape for engineering departments, as a protective cover for polished metal, for use in marking defects. Permacel Tape Corp.

21—VACUUM CLEANER for use where electricity isn't

Vacuum cleaning is available beyond the power line with this new gasoline-driven unit. It has the same characteristics as company's 1½ hp industrial motor operated unit. It is designed for locations that do not have electricity or where the electric cable would be inconvenient. This unit uses the same hose and tools as standard models and operates for 3½ hr on one filling. A descriptive leaflet is offerred. The Spencer Turbine Co.

22—CASTERS have wheels with demountable tires

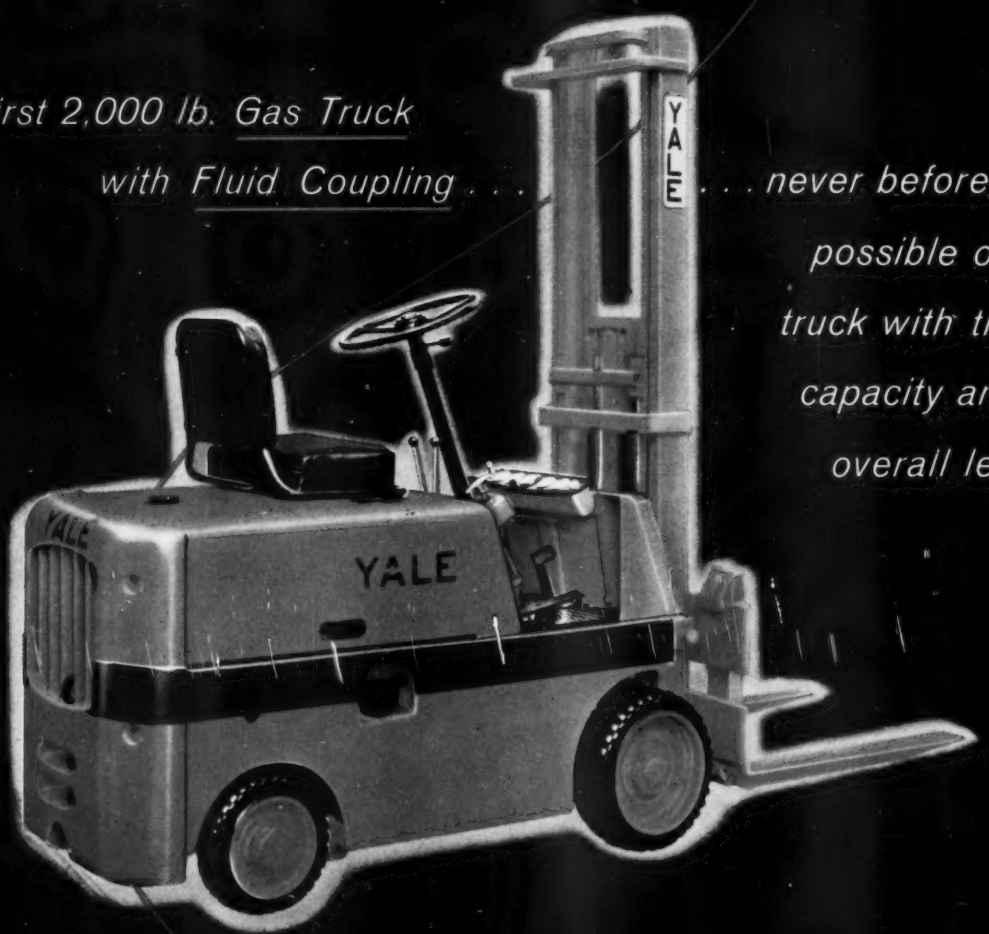
This manufacturer's Series 68, H68 and H99 industrial and institutional plate-mounted casters now have wheels with replaceable soft rubber tread tires. The wheels feature smooth-operating ball bearings which company claims cannot get out of adjustment, and full case-hardened bearing surfaces. Bolted steel disk construction allows easy replacement of worn tires, while rubber treads are vulcanized to non-stretching tire base to prevent distortion of soft treads. Recom-

For more facts circle 586 on Reply Card →

YALE

ANNOUNCES ANOTHER MATERIALS HANDLING EXCLUSIVE

The first 2,000 lb. Gas Truck with Fluid Coupling . . .



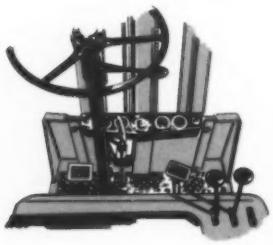
. . . never before possible on a truck with this capacity and overall length

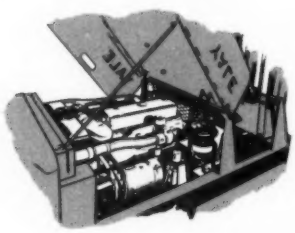
AVAILABLE WITH
PNEUMATIC OR SOLID TIRES

TURN PAGE FOR IMPORTANT FEATURES

Once again YALE engineers bring you an entirely new truck

...with cost-cutting advantages no other 2,000, 3,000 and 4,000 lb. capacity trucks can match





GREATER VISIBILITY AND SAFETY

Low cowl gives operator better visibility...permits greater stacking accuracy...safer operation.

OPERATOR EFFICIENCY

All controls positioned for maximum efficiency and comfort. Gear shift is on steering column...service brake alongside column.

PNEUMATIC OR SOLID TIRES

Available on all models...for indoor or outdoor operation.

FLUID COUPLING

The coupling, built into the flywheel, reduces overhang and overall length. Fluid coupling provides cushioned-drive to safeguard both truck and load.

MAXIMUM FREE LIFT

Maximum free lift unit with simplex or duplex hoisting cylinder, enables truck to stack materials in low headroom areas.

IMPROVED CHANNEL ASSEMBLY

Roller guided channels last longer. Side thrust rollers permit off-center loading. Snag-proof attachment hoses placed inside channels.

EASIER MAINTENANCE

One-piece removable engine hood permits easy, immediate access to all engine parts.

MAXIMUM POWER

Engines have power for every handling job...dissipate heat quickly and efficiently by muffler located in airstream.

EXCLUSIVE HYPOID GEARS

They last longer, need less maintenance...even under constant, heavy-duty operation.

...and here are just a few other Yale advantages that make this the Gas Truck of the year

Driver's seat accessible from either side • Easier to maneuver • One-piece housing for drive unit Low hydraulic pressure • Up-right stabilizing unloading valve • Safety valve lowering control Instrument panel conveniently located for readability

MAIL THIS COUPON TODAY

The YALE & TOWNE Manufacturing Co., Dept. 475
11000 Roosevelt Blvd., Philadelphia 15, Pa.

☐ Please have local YALE representative call.
☐ Please send full information on new YALE Gas Truck.

COMPANY_____

NAME_____ TITLE_____

STREET_____ CITY_____ STATE_____

In Canada write: The Yale & Towne Manufacturing Company St. Catharines, Ontario, Canada

YALE

INDUSTRIAL TRUCKS AND HOISTS

Reg. U.S. Pat. Off.

Gas, Electric, Diesel & LP Gas Industrial Trucks
Worksavers • Hand Trucks • Hand & Electric Hoists • Pul-Lifts

Trouble Free Design—

only one moving part—
the absolute minimum
of wear

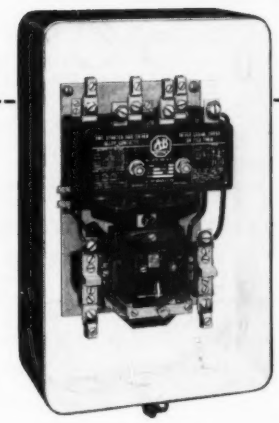
—guarantees millions of
trouble free starter
operations

● ALLEN-BRADLEY solenoid starters are trouble free because they have only ONE moving part. Also, the reliable straight up-and-down solenoid motion is frictionless.

The simple solenoid action . . . enclosed arc hoods . . . maintenance free, double break, silver alloy contacts . . . reliable overload relays . . . bonderized cabinet with white interior—are the plus features that you secure at no added cost when you buy Allen-Bradley solenoid starters.

For trouble free motor control, specify Allen-Bradley. It's QUALITY control!

Allen-Bradley Co.
1317 S. First St., Milwaukee 4, Wis.



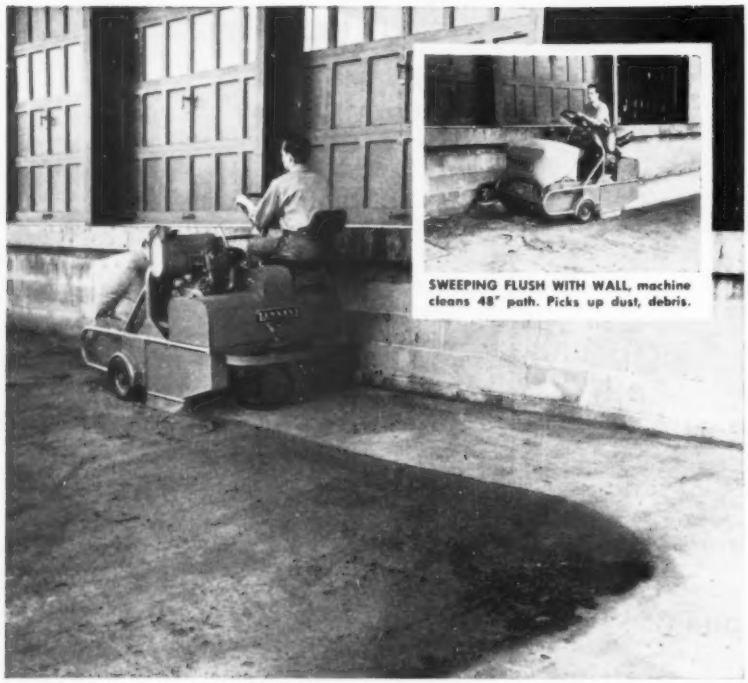
Bulletin 709 Solenoid Starter, Size 3. Max Rating: 30 hp, 220 v; 50 hp, 440-550 v.

A-B Quality

THE SIGN OF
QUALITY
IN MOTOR CONTROL

ALLEN-BRADLEY
SOLENOID MOTOR CONTROL
QUALITY

For more facts circle 587 on Reply Card



WITH A TENNANT "75" SWEEPER, one man sweeps this path in about 5 seconds.

he does a faster, cleaner job than a 3 to 12-man crew

In a few fast seconds, one man sweeps the path shown here—at a rate a skilled pushbroom crew of 3 to 12 men couldn't begin to equal.

And note the *extra clean* job he does with this TENNANT Sweeper. He sweeps a uniformly clean 48" path . . . works flush with the wall . . . turns in a 5 ft. radius . . . can dump the loaded dirt hopper in 30 seconds.

Labor-saving results like this, plus heavy-duty construction, shows why a TENNANT Sweeper can usually pay for itself in 1 to 6 months—in manhours alone. *Write for additional cost-saving details.*

TENNANT
ESTABLISHED 1870

G. H. TENNANT CO.
2572 N. 2nd Street
Minneapolis 11, Minn.

POWER SWEEPERS

INDUSTRIAL MAINTENANCE EQUIPMENT

G. H. TENNANT COMPANY
Minneapolis 11, Minnesota

Please send more details on manhour-saving performance of NEW Tennant Power Sweepers.
☐ 24" path; ☐ 36" path; ☐ 48" path. ☐ Gas powered; ☐ Electric.

Name _____ Title _____

Company _____

Address _____

For more facts circle 588 on Reply Card

NEW PRODUCTS

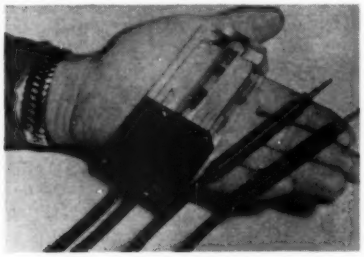
(Begins on page 156)

mended operational load ratings have been calculated to allow a margin of safety for overload or severe operating conditions. More information is given in Catalog 4R-54. The Bassick Co.

23—VOLTAGE TESTER is improved electronic device

The Model AP 1 is announced as an electrical voltage tester with which there can be no mistaking a higher voltage for a lower one, for testing circuits from 90 to 600 v. By substituting an electronic means for a mechanical one, the voltages can be separated by large, easily distinguished marks, manufacturer says. The tester is made of solid plastic, is described as more rugged, lighter and smaller than mechanical types, yet large enough to be held conveniently.

The operating section is transparent. A low voltage lights only the bottom part, and higher voltages cause the light



to climb up the tube. Company says this tester will indicate voltage on all frequencies from d-c to 400 cycles on the same scale, and will indicate polarity on d-c. Also, it has such standard features as 30 in. leads of 10,000-v wire, and a place to bury the prod tips. The net price is under $9. Craft Laboratories.

24—TOWING TRACTOR, redesigned for greater safety

The Clarkette 5 line of general utility towing tractors has been redesigned for greater driving safety, comfort and simplicity at no increase in price. Among new features announced for this 500-lb drawbar pull capacity machine are: driver platform lengthened and brake pedal relocated to allow the operator more room without affecting turning radius and intersecting aisle dimensions; control lever altered to reduce hand fatigue and the center control linkage moved to a lower cross bar; and relocation of the exhaust pipe to reduce fumes reaching the operator's platform. Clark Equipment Co.

25—SENSITIZED PAPER for diazo copying machines

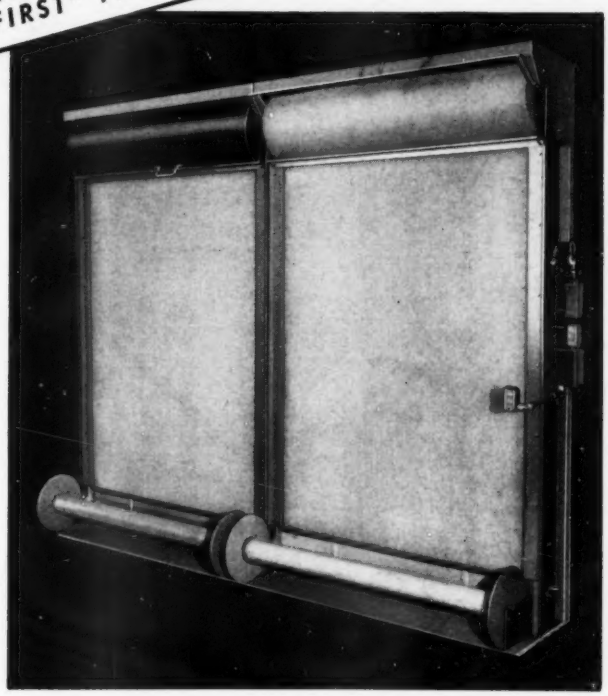
This improved sensitized paper is being introduced for use with the diazo process of reproduction. Prints made on the new paper are said to offer sharper contrast, truer reproduction, and more uniform density. Weak image lines from poor

INTRODUCING THE *NEW*

Roll-O-MATIC

ANOTHER AIR FILTER "FIRST" FROM AAF

A "Dry" Type Viscous Air Filter That Maintains Its Efficiency Automatically Up To One Year With One Roll of Low-Cost AMER-glas Media



A ROLL-O-MATIC filter of two 5'0" wide by 8'0" high sections—capacity 26,700 cfm.

So automatic you don't even push a button! That's the new ROLL-O-MATIC—a high efficiency air filter that maintains its established operating resistance for months on end without an hour lost or a dollar spent for maintenance.

The ROLL-O-MATIC is a viscous filter with "dry" type characteristics—combines the efficiency and simplified maintenance of a dry filter with the high dust holding capacity and velocity characteristics of a viscous unit. The filtering media is a 2" thick AMER-*glas* mat made up of continuous glass fibres sprayed with non-flammable Viscosine fluid-jell.

The AMER-*glas* media, in roll form, is mounted at top of the ROLL-O-MATIC and moves as continuous curtain down the face of the filter and re-rolled on motor-driven spool at the bottom. A pressure differential switch regulates the movement of the filter curtain so that media usage is in direct proportion to the dust content of the air. Field tests indicate that, under normal operating conditions, a single roll of AMER-*glas* should last *one year* per 10,000 cfm of capacity. But regardless of amount of media used, the cost will be less than that of throw-away filters.

Other ROLL-O-MATIC advantages are (1) lighter weight, (2) low-cost installation and (3) elimination of all drain and water connections. For complete design and engineering data, call your local AAF representative or write direct for Bulletin No. 248.

AAF

American Air Filter

COMPANY, INC.

228 Central Avenue, Louisville 8, Kentucky • American Air Filter of Canada, Ltd., Montreal, P. Q.

For more facts circle 589 on Reply Card

No. 5166-GS-B

Snap-on* MECHANICS STANDARD SERVICE SET

● No time lost hunting *the right tool* when this carefully planned Snap-on set is at hand. No time-wasting "make-do" with sloppy misfit tools! Each of the 166 tools in the set is a basic in handling operations most frequently encountered in all types of maintenance work. In orderly arrangement in the big six-drawer chest, they are *safe,* and right at the finger tips when needed. Available through your nearby Snap-on factory branch. For free 104-page catalog of 4000 Snap-on hand and bench tools, write

SNAP-ON TOOLS CORPORATION
8068-E 28th Avenue, Kenosha, Wisconsin

*Snap-on is the trademark of Snap-on Tools Corporation.

For more facts circle 590 on Reply Card

NEW PRODUCTS

(Begins on page 156)

originals are "perked up" when reproduced on the new paper, it is claimed, and it even catches various shades of gray in pencil sketches. It is also said to offer a wider latitude for operator error. It is available in three speeds, in both sheet and roll form, in widths to 54 in. Charles Bruning Co., Inc.

26—HEAVY OIL BURNER offers heating flexibility

Because of its 35 per cent increase in capacity, the new Model 4 Hev-E-Oil Burner is adaptable to a wider range of heating conditions. It is intended for use where a burner is used to heat a building containing over 1500 sq ft of radiation, or where more than 6000 gal of oil or 45 tons of coal per year is burned.

With its larger capacity, the new "4" also incorporates features designed for increased fuel savings, less maintenance and simplified installation. Like other models in this manufacturer's Hev-E-Oil Burner line, this is a low pressure, air-atomizing type. It is said to be the only modern all-electric ignition oil burner designed to burn low-cost No. 4 or 5 oil without preheating. According to manufacturer, greater efficiency is gained without increase in power consumption; it is sensitive to heat demands and provides steady proportioned heat for power loads and heating. Cleaver-Brooks Co.

27—TRAILER for use with overhead towing systems

A 4,000-lb capacity, caster steer trailer for overhead tow systems has a standard hardwood deck 3 by 6 ft. It is fitted with stake pockets at both sides and rear for removable pipe racks. A permanent angle iron rack at the lead end is used to mount

a V-type tow chain and hook assembly, fitted with shock absorber springs, and a push bar handle for man-handling the trailer. Deck size and construction can be altered as required. Mercury Mfg. Co.

28—D-C AMPLIFIER for industrial and laboratory use

Series 80 D-C Amplifiers convert low level d-c microampere or millivolt inputs to a high level d-c current output. Incorporating a high gain feed back loop, the new amplifier is reported to have exceptional long and short term stability characterization. It is suitable for applications involving measurement or recording of

Handclasp of a friend-in-need

There's confidence in the very "feel" of the world famous C-O-TWO Squeez-Grip Carbon Dioxide Type Fire Extinguishers. The quick-acting "Squeez-Grip" fits your hand naturally like a handclasp... hangs right... carries right... works right. You're in complete command of the situation instantly... no fumbling... no fatigue.

From the non-conducting, shatterproof discharge horn to the high strength, durably finished cylinder, you get top quality construction that results in a lifetime of satisfactory service. Because of the very few working parts and corrosion resistant materials throughout, the total cost to you over the years is less than other initially lower priced makes... fire after fire, recharge after recharge, without trouble.

It's not hard to see, when you fully compare and try, why C-O-TWO Squeez-Grip Carbon Dioxide Type Fire Extinguishers are your best buy for killing flammable liquid and electrical fires, as well as some surface fires involving ordinary combustible materials. Sizes range all the way from 2½ to 100 pounds capacity... all fully approved by the Underwriters' Laboratories, Inc., Factory Mutual Laboratories, Armed Forces and Government Bureaus.

With C-O-TWO Squeez-Grip Carbon Dioxide Type Fire Extinguishers the penetrating carbon dioxide is a clean, dry, non-damaging, non-conducting, inert gas... smothers fire instantly, leaves no after fire mess... harmless to equipment, materials and finishes... even food is still perfectly edible.

Act now for complete free information on these first-rate, sure-acting fire extinguishers. Remember fire doesn't wait ...get the facts today!

C-O-TWO

MANUFACTURERS OF APPROVED FIRE PROTECTION EQUIPMENT

Squeez-Grip Carbon Dioxide Type Fire Extinguishers
Dry Chemical Type Fire Extinguishers
Built-In High Pressure and Low Pressure Carbon Dioxide Type Fire Extinguishing Systems
Built-In Smoke and Heat Fire Detecting Systems

C-O-TWO FIRE EQUIPMENT COMPANY
NEWARK 1 • NEW JERSEY

C-O-TWO FIRE EQUIPMENT OF CANADA, LTD. • TORONTO 8 • ONTARIO

Sales and Service in the Principal Cities of United States and Canada

AFFILIATED WITH PYRENE MANUFACTURING COMPANY

For more facts circle 591 on Reply Card

Better DUST CONTROL ENGINEERING IS IMPORTANT!

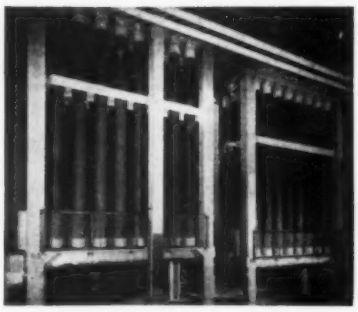
DAY *engineered* dust control includes plant survey, system layout, strategic location of equipment and efficient installation. These factors and many more are included in DAY'S *engineered* dust control to assure you the utmost in effectiveness and over-all economy.

DAY *engineered* dust control is backed by a program of constant research for greater equipment and system efficiency. For example, DAY engineers achieved an important advancement in dust filter efficiency with the development of DAY'S patented SELF-ADJUSTING BLOW RINGS for the DAY "AC" (Hersey Type) Dust Filter. These blow rings compensate for any variation in filter tubes due to changes in temperature, pressure, moisture conditions, etc. *They assure perfect cleaning air contact.*

Photo shows two of eight DAY "AC" Dust Filters used by Chas. Pfizer & Co., Inc. The filters shown are located at the Groton, Conn. plant. DAY'S Reverse Jet Cleaning permits the use of a better grade of pressed wool felt which captures even submicron dust particles.

5 Important DAY Advantages

1. DAY'S continuous Reverse Jet Cleaning permits the use of more efficient filter media which gives filtering efficiencies up to 99.99+%.
2. Constant air volumes are maintained.
3. Continuous, automatic operation without the necessity of shutting down any section for cleaning.
4. Air-to-cloth ratios to as high as 20 to 1.
5. Self-Adjusting Blow Rings assure perfect reverse air to cloth contact.



Two of the eleven DAY "AC" Dust Filters used by Pillsbury Mills, Inc. The filters shown are in the cake mix plant at Hamilton, Ohio. Space and headroom were at a premium in this modern, one story plant and the dust control equipment was placed to consume a minimum amount of space. Leading millers and food processors recommend DAY for dust control engineering.

Write For New Bulletin

If you have a dust control problem, whether it involves a complete system or a single unit, your inquiry is invited. WRITE FOR BULLETIN 528-R.

The DAY Company

807 Third Ave. N. E., Minneapolis 13, Minn.

IN CANADA: P. O. Box 70G, Ft. William, Ontario
Branch Plants: Buffalo, Fort Worth, Welland, Ontario

Representatives In Principal Cities

DAY SINCE 1881
DUST CONTROL
A SINGLE UNIT OR A COMPLETE SYSTEM

DAY "AC" Dust Filter installation, Lapp Insulator Company, LeRoy, New York. The company reports—"most of our dust is very fine and varies in size from 1 micron to 25 microns. The DAY Dust Filter solved our dust problem". DAY "AC" Filters consistently provide filtering efficiencies up to 99.99+%.

For more facts circle 592 on Reply Card

NEW PRODUCTS

(Begins on page 156)

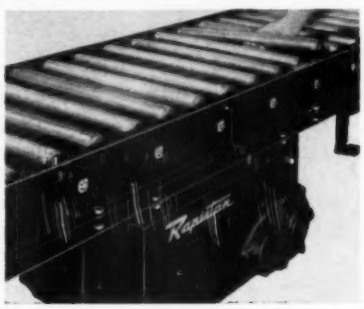
low level d-c signals, and is also designed for use as a thermocouple amplifier.

Of the null balance type, the new amplifiers have high impedance when used with voltage inputs, it is explained, thus drawing no current from the source. Where the input is current, the input impedance is negligible. Simple in design, these amplifiers are offered at $150 for the single input, $175 for a triple range unit. Ranges extend from 5 microvolts and 20 microamperes full scale; ouput is 5 milliamps full scale. Fielden Instrument Div., Robertshaw-Fulton Controls Co.

29—ROLLER CONVEYOR designed for greater safety

The Rapistan LR Live Roller Conveyor is intended primarily for long distance handling of materials varying in shape, size and weight. Articles can be stopped at any point on this conveyor without interfering with flow of goods along the line. The unit has carrier and pressure rollers in the same frame, and a motor driven belt runs between the two sets of rollers, activating the upper carrier rolls which carry materials along. Lower pressure rolls in any 5-ft section are adjustable, up or down, to provide proper belt contact for straight carrying, accumulated loading, or sweep-on sweep-off operations.

A special safety feature of this conveyor is "free floating" action of carrier rollers. Each roller rides in slots in the side frames, it is explained, and should clothing or fingers be drawn between



rollers and drive belt, the rollers pop up and out to prevent injury. Drive and take-up units are separate, self-contained packages, mountable anywhere on the under flange of the conveyor frame. The conveyor is made up of 10-ft sections which can be combined for unit lengths to 150 ft. There are eight frame widths from 15 to 39 in. Individual roller capacity is 250 lb; standard roller speed is 80 fpm. The Rapids-Standard Co., Inc.

30—WIRING BOARD is an improved printed unit

A printed wiring board capable of simplified manufacturing methods is announced. The new manufacturing method involves plating required wiring on the board and, at the same time, plating

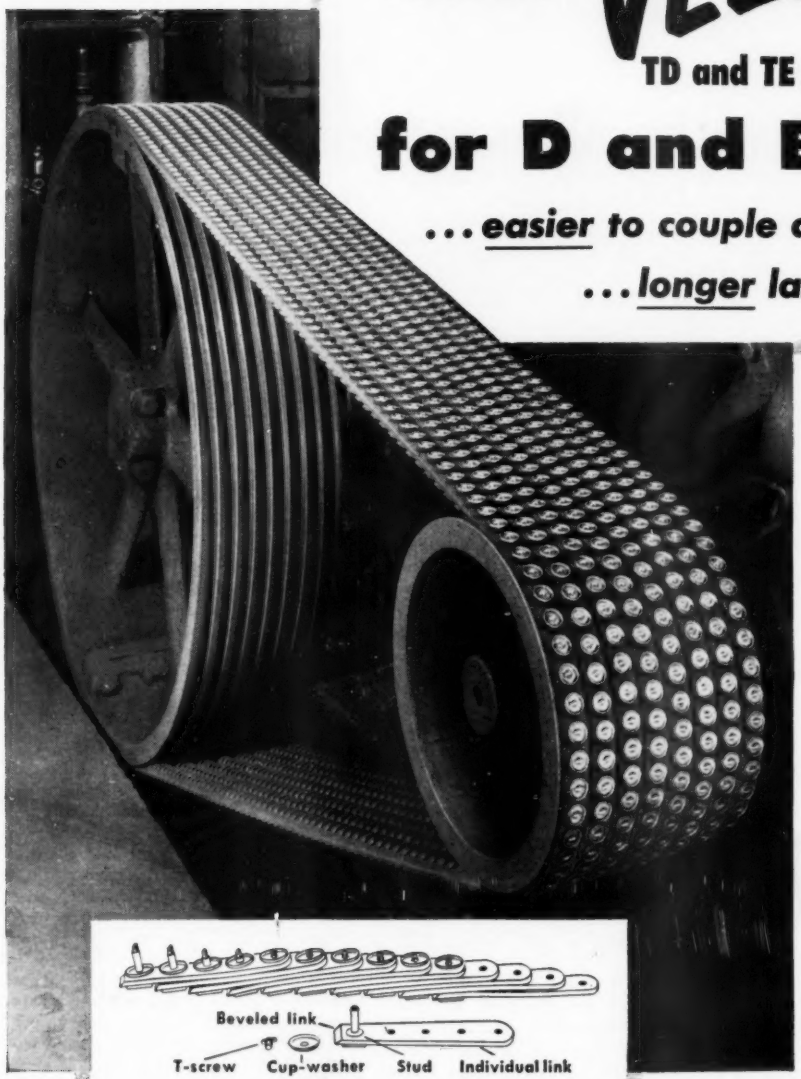
NEW VEELOS

TD and TE Adjustable V-belts

for D and E Drives

...easier to couple and uncouple

...longer lasting



This detailed line drawing of the new Veelos TD and TE v-belt makes it easy to see how this new v-belt is designed to do a better job... easier!

Now get the v-belt that's been especially developed for D and E drives—the new, patented Veelos TD and TE adjustable v-belt!

This new Veelos has advantages unmatched by any other v-belt. It is *installed quickly* without removing the outboard bearings found on most D and E drives. It is the easiest v-belt to couple and uncouple ever developed. Cup-washers and T-screws join links together to form individual belts of any length. Veelos TD and TE *lasts longer* because new high-tensile strength links plus the new stud, cup-washer and T-screw design give *added strength* —combines this added strength with *maximum flexibility* for cooler, smoother running.

Install this new Veelos TD and TE v-belt on your D and E drives. Prove to yourself why there's no v-belt that can match the performance, the efficiency and the economy of Veelos TD and TE.

Get the complete story of this great new v-belt for D and E drives. Send the coupon now for new 8-page illustrated catalog.

VEELOS
THE LINK
V-BELT

Veelos is known as Veelink outside the United States.

T1

MANHEIM MANUFACTURING & BELTING CO.
652 Manbel St., Manheim, Pa.

Please send copy of your new Veelos TD and TE v-belt catalog.

Name.....

Company.....

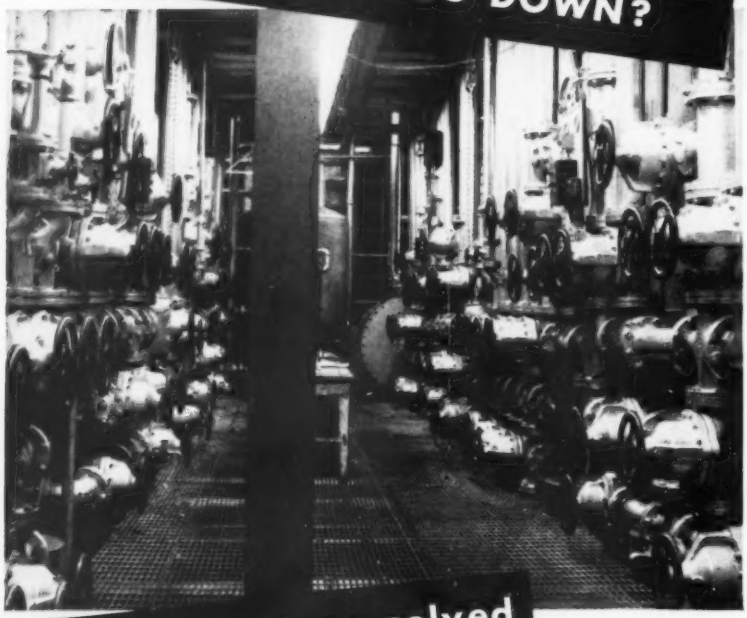
Address.....

.....

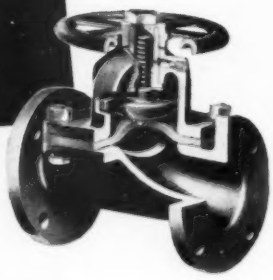
ADJUSTABLE TO ANY LENGTH • ADAPTABLE TO ANY DRIVE

For more facts circle 593 on Reply Card

VALVE MAINTENANCE COSTS GETTING YOU DOWN?



The problem was solved in this plant with HILLS-McCANNA diaphragm valves



IF YOU HANDLE CORROSIVE FLUIDS
THEY'LL DO THE SAME FOR YOU

The unique Saunders Patent design of Hills-McCanna Diaphragm Valves completely isolates the working parts of the valve from the flow. There is no packing to tighten or replace . . . no problem of leakage, internally or externally. You have a choice of body materials of any machinable alloy or linings of lead, glass, rubber, plastic, etc. Fifteen diaphragm materials are available including rubber, Neoprene and Teflon. There is also a wide choice of manual or remote operators. Sizes range from ⅜" through 14". May be used at pressures to 150 psi, temperatures to 350° F.

If you valve corrosive materials write today for descriptive folder. For specific recommendations send an outline of your requirements. HILLS-McCANNA CO., 2450 W. Nelson St., Chicago 18, Ill.

HILLS-McCANNA

saunders patent diaphragm valves

Also manufacturers of
Chemical Proportioning Pumps • Force-Feed Lubricators
Magnesium Alloy Sand Castings

V-11

For more facts circle 594 on Reply Card

NEW PRODUCTS

(Begins on page 156)

through terminal holes in the board so as to establish a connection between the two sides without use of eyelets or specially designed terminal pins. According to company, the new boards will be priced competitively with circuit boards made in the conventional manner. They are described as a step toward simplified automatic assembly of electronic equipment.

The printed eyelet process permits plating holes as small in diameter as the thickness of the materials on which the wiring is plated. It eliminates eyelets and connecting pins, provides a higher consistent quality than many methods, it is said, and offers a means of overcoming possible shortages of the type of copper used in some processes. Also, using of the new plating method application of the wiring need not be restricted to flat surfaces, as it is also applicable on curved surfaces. General Electric Co.

It's easy to obtain product data with the postage-free Reader Service Cards on pages 35-36 and 119-120. Use them for information on advertised products, too. Just circle the key number appearing at bottom of the ad.

31—MOTOR PUMP for air conditioning, refrigeration

The ¾ KRVSA Motorpump is a centrifugal pump for air-conditioning and refrigeration service. It is a single-stage, 3450 rpm unit with a keyed, cap screw type impeller attachment for positive fastening. The balanced impeller has a built-in shaft sleeve to prevent motor shaft corrosion. Standard jet pump motors ⅓ through 1 hp are used, and the pump will deliver capacities to 48 gpm at heads to 100 ft. A mechanical seal consisting of a rotating ceramic face against a stationary Teeplelite face is designed to prevent stuffing-box drips and eliminate motor overloads. More information is given in Bulletin 7126-D. Ingersoll-Rand Co.

32—CONVEYOR BELTS, lightweight, in three types

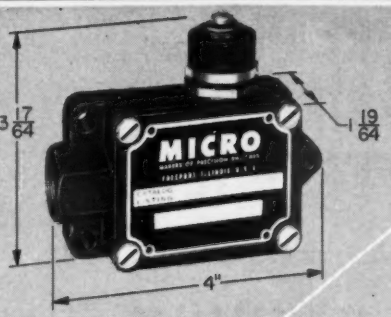
A new line of lightweight industrial conveyor belts includes Koroseal Belts and those with "eye rest" green color for inspection service. According to manufacturer, the Koroseal Belt has excellent resistance to abrasion, oils, grease and many acids. It has a smooth non-porous surface to resist flaking or checking and eliminate danger of contamination of materials handled.

Highseal and Kleenseal Belts are distinguished by a pleasing green color, said to increase inspection efficiency by reducing glare and eye strain. Special belt surfaces make them easy to clean, it is

MICRO SWITCH Precision Switches

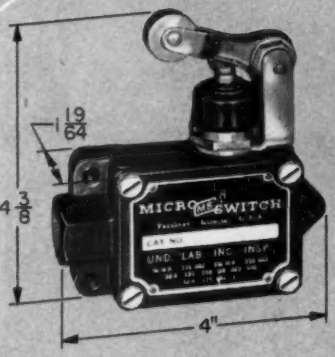
A PRINCIPLE OF GOOD DESIGN

For right hand mounting

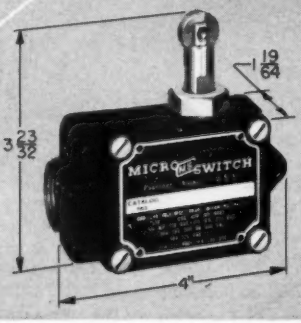


MICRO SWITCH "BAFI" switch with sealed plunger actuator. Underwriters' listed for 1 HP, 115 volts a-c; 2 HP, 230 volts a-c. Circuit arrangement—single-pole, double-throw.

For left hand mounting



MICRO SWITCH "BAFI" switch with sealed roller lever actuator. Roller arm is adjustable horizontally through 360 degrees, vertically through 225 degrees.



MICRO SWITCH "BAFI" switch with roller plunger actuator. Can be used with cams having approach angle of 30 degrees or less. Roller adjustable to any angle of approach.

Here's a HIGH CAPACITY switch to meet exacting plant applications

Many plant applications call for installation of a switch of more than average electrical capacity.

MICRO SWITCH "BAFI" general utility precision switches meet this requirement with the capacity to make and break steady state currents of 20 amperes, 125, 250 or 460 volts a-c. They will handle inrush currents as high as 75 amperes. They are suitable for controlling tungsten filament lamp loads on a-c current.

The MICRO SWITCH "BAFI" switches are typical of a wide variety of MICRO SWITCH designs which have proved successful in countless industrial applications. They are used as safeties, limits and interlocks to make present plant equipment more automatic, safer and more productive. All are available for either right or left hand mounting.

These switches are carried in stock by 176 MICRO SWITCH Distributors in 155 key cities. Are you on the mailing list for *MICRO TIPS?* This live publication is full of factory-tried ideas on how to make plant equipment more efficient. Ask your MICRO SWITCH distributor about *MICRO TIPS*—or write us today.

MICRO SWITCH

A DIVISION OF MINNEAPOLIS-HONEYWELL REGULATOR COMPANY

FREEPORT, ILLINOIS

H HONEYWELL

For more facts circle 595 on Reply Card

PEAK LIGHTING EFFICIENCY

MAXIMUM SAFETY

MINIMUM COST

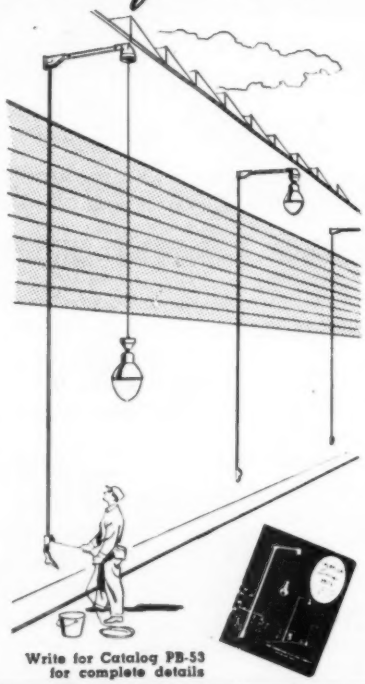
WITH THOMPSON *Servisafe* UNITS

Rapid, safe, ground-level luminaire maintenance is guaranteed when THOMPSON "Servisafe" wall bracket units are installed. Incorporating a patented disconnecting and lowering mechanism, these easy-to-operate units completely eliminate dangerous climbing. In addition, because lowered luminaire is "dead", there are no electrical hazards for maintenance men. Servicing time and costs can be cut to absolute minimum.

These safety features of the new THOMPSON "Servisafe" units permit a planned low-cost program to maintain peak lighting efficiency at all times.

"Servisafe" models for wood pole bracket mounting as well as complete metal pole assemblies also are available.

1949-TE



Write for Catalog PB-53 for complete details

THE THOMPSON ELECTRIC CO.

1165 POWER AVENUE • CLEVELAND 14, OHIO

For more facts circle 596 on Reply Card

NEW PRODUCTS

(Begins on page 156)

noted. Completing the new line of belts is an "economy" black belt designed for low cost operation and to reduce maintenance problems caused by excessive changes in belt length. A new lightweight fabric is used in this line of belts. It is announced as having high resistance to moisture when impregnated with special compounds and to have long flex life even when operated over small pulleys. The B. F. Goodrich Co.

33—EAR PROTECTORS guard against harmful noise

Muff-type sound protectors, Straightaways are guaranteed to give excellent protection against both high- and low-frequency injurious noise—and to be safe, sanitary and comfortable to wear. They require no special fitting, are visible to supervisory personnel, and are described as washable and non-irritating to the skin. Three styles are available: medium-weight cotton helmet; lightweight, cool

nylon-mesh helmet; and a headband type for intermittent use. Helmet types, in gold, green or brown, are designed for use with safety glasses and hard hats. The headband type, in black or white, permits use of safety glasses. Literature and prices available. David Clark Co., Inc.

34—IGNITRON has provision for thermostatic cooling

Provision for thermostatic control of cooling water is supplied on the Size B Ignitron, WL-5551-A, which can replace company's standard model, WL-5551. The new one is a sealed, stainless-steel jacketed water-cooled, mercury-pool tube. A suitably calibrated thermostat, attached to the mount provided on the side of the tube, may be used to stop tube operation in case of insufficient water flow, or with a solenoid water valve to turn cooling water on and off as needed. The tube is designed primarily for resistance welding control. Two tubes normally used with single-phase welders will control 600 kva at 250 to 600 v over a 25- to 60-cycle frequency range. Electronic Tube Div., Westinghouse Electric Corp.

35—TEST UNIT has built-in ammeter and timer

Similar in design to company's other models, the new Multi-Amp Model 1010/336/360 is a self-contained portable high current testing instrument with built-in six-range 0 to 1000 amp ammeter and an electronically actuated timer. The latter

Any way you look at it this Thermometer is *Easy Reading*

You've been asking for a dial thermometer like this—A thermometer that can be positioned and firmly locked at any practical angle—now you can have it!

No stretching or straining to see this thermometer. Easy to adjust to required new positions before or after installation. No risk of the multi-angle selector working loose. A specially designed selector assures positive locking at every practical mounting angle and a few turns of *one* nut lock the selector securely.

These instruments, supplementing USG's complete line of Gotham temperature indicators, are designed to fit all standard connections and are available in all standard ranges. If you have a number of applications requiring "odd angle" mounting these new multi-angle thermometers will reduce the number and variety of instruments you have to carry in stock.

Before you order an angle thermometer be sure you see USG's new Gotham Multi-Angle Thermometer.

ADVANTAGES

1. Positive locking in every conceivable angle.
2. Reduces the number and variety of instruments required in your maintenance stock.
3. Provides that extra "odd angle" instrument which normal stock does not furnish.
4. Easy to change to any desired angle, before or after installation.
5. Saves engineers time when writing specifications.
6. Affords easy reading at odd angles.

UNITED STATES GAUGE

United States Gauge
Division of American Machine and Metals, Inc.
Sellersville, Zone 5, Pa.

Gentlemen:
We'd like to know more about the new USG Multi-angle Thermometer. Please get in touch with us.

Name_____ Title_____

Company_____

Address_____

City_____ Zone_____ State_____

For more facts circle 597 on Reply Card

Fyr-Fyter

DRY CHEMICAL EXTINGUISHERS

Reach for Fyr-Fyter Dry Chemical Extinguishers . . . with absolute assurance of protection performance! They're engineered to PERFORM with "Sealed-In" power that's harnessed in perfected air-tight, water-tight sealing to provide fast, positive, fire-fighting action . . . *without fail!* The simple, squeeze-grip nozzle control releases a thrust of force that's SURE . . . expelling a long-range, heat-shielding, flame-smothering stream of free-flowing chemical powder. On contact, the flame-smothering powder puts out fires in gasoline, petroleum products, paint, varnish, lacquer, turpentine, alcohol . . . *all flammable liquids, gas, butane, propane, chemical and electrical fires!* Stainless steel tank and aluminum castings provide extra strength for more rugged use, and less weight for easier handling.

For assured protection performance . . . be SURE with an Underwriters' Approved Fyr-Fyter Dry Chemical Extinguisher!

WRITE ON YOUR LETTERHEAD FOR FULL DETAILS TODAY!

FF-5

The Fyr-Fyter (FIRE) (FIGHTER) Co.

221 CRANE STREET, DAYTON 1, OHIO

REPRESENTATIVES IN PRINCIPAL CITIES

BRANCH OFFICES: *New York, Boston, Philadelphia, Chicago, Atlanta, Dallas, San Francisco, Portland, Seattle.*

For more facts circle 598 on Reply Card

NEW PRODUCTS

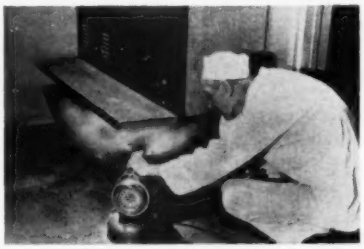
(Begins on page 156)

consists of a synchronous motor-driven electric stop timer with a thyratron controlled clutch arrangement. This timer can be furnished to totalize 60 sec in hundredths of a second or 60 minutes in hundredths of a minute.

Designed to operate only when test current is flowing through the device being tested, the timer measures tripping time or motor overload relays, circuit breakers and fuse links while operated under simulated overload conditions. The new model has a 1 kva rating. Input is 0 to 10 amp, 110 v, 60 cycle a-c. Output is adjustable from 0 to 500 amp at 0 to 2 v; 0 to 100 amp at 0 to 10 v; 0 to 50 amp at 0 to 20 v; 0 to 25 amp at 0 to 40 v, and 0 to 10 amp at 0 to 100 v. A catalog of dimensions and applications is offered. Multi-Amp Corp.

36—SMALL SPRAYER K.O.'s flying, crawling insects

A new medium-priced, semi-automatic, electrically-operated portable sprayer for control of flying and crawling insects in industrial plants and institutions is called the Robot Mistorizer. This machine is designed to break down either oil- or water-based insecticides into a dry mist



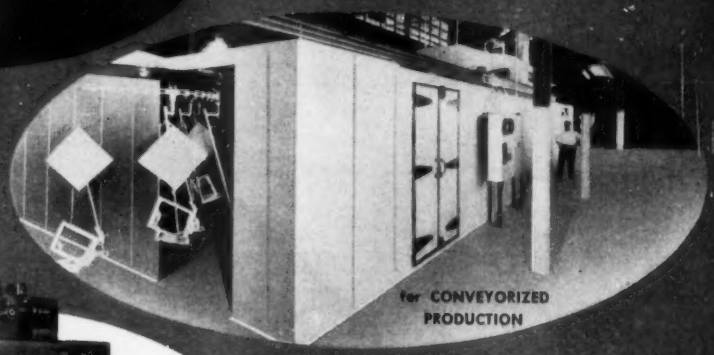
and eject them under high pressure. The insecticide is converted into an insect-killing fog, which remains suspended for extended periods of time and penetrates cracks and crevices for a complete kill.

The machine features an automatic timer which can be adjusted to turn off the spray after a prescribed period of time. A built-in regulator permits adjustment of the amount of insecticide dispensed, from 1 pt to 1 gal per hour. Dual nozzles afford wider area coverage. The machine has a 1-gal capacity tank, is powered by a ⅓ hp motor, and weighs 13 lb. West Disinfecting Co.

37—DUST REMOVAL SYSTEM for low cost housings

This new type liquid precipitating stack gas scrubber has been developed for installation in low cost housings of cinder block, concrete or fabricated steel. It is said to remove large volumes of dust from the stacks of cyclones, rotary driers, kilns, mixers and similar installations, and operating efficiency is declared such that it removes dust particles of submicron sizes even at high dust loadings. Eight models high-temperature gases

KIRK AND BLUM
INDUSTRIAL OVENS



for CONVEYORIZED PRODUCTION

for BATCH PRODUCTION

Specially designed to solve your problem . . . KIRK & BLUM Ovens meet all needs for drying, baking, dehydrating or other more specialized requirements.

Often Kirk & Blum Ovens up to freight car size are shipped completely assembled, tested and ready to operate. Then, they can be connected and in use in a few hours, saving time and expense. Illustrated are typical installations which show the wide range of KIRK & BLUM experience over more than 47 years.

If you have an oven application, discuss it with a KIRK & BLUM Engineer. There's no obligation. Write for free literature.

for TESTING or LABORATORY

THE KIRK & BLUM MFG. CO.,
3189 Forrer St., Cincinnati 9, Ohio

KIRK AND BLUM
INDUSTRIAL OVENS

For more facts circle 599 on Reply Card

THIS COUPON BRINGS YOU A COMPLETE INDUSTRIAL DOOR HANDBOOK

INTERNATIONAL STEEL COMPANY
2012 Edgar St., Evansville 7, Indiana

Send me without cost or obligation my personal copy of the new International Industrial Door Handbook:

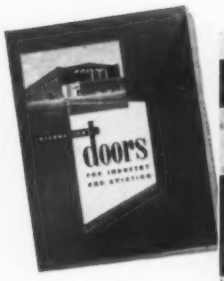
NAME _____ TITLE _____

FIRM NAME _____

ADDRESS _____

CITY _____ ZONE ____ STATE _____

How to Cut Corners On Your Plant Door Needs



International Vertical-Lift Door — Installation for Orr Iron Co., Evansville, Ind.

TODAY . . . in every type of plant in every part of the country . . . doors by International Steel are being installed in ever-greater numbers. Sizes range from small right up to the world's largest. Methods of operation include manual, motorized, and the most advanced applications of electronic controls. But all have one thing in common — they were engineered and built to best do their jobs, at lowest practical first cost and with minimum long-term maintenance. That's what happens when you invite International in at the planning stage. Odds are all in your favor that we will help you cut a lot of cost and time corners. Send in the coupon above now. Our complete Industrial Door Handbook will provide conclusive evidence that International can meet your *every* door need . . . *better*.

INTERNATIONAL SERVICE

2012 EDGAR STREET • EVANSVILLE 7, INDIANA

INTERNATIONAL STEEL COMPANY

For more facts circle 600 on Reply Card

NEW PRODUCTS

(Begins on page 156)

in capacities from 8000 to 60,000 cfm. Of importance where water is expensive or hard to obtain, is the low water requirement of this system. According to manufacturer, only 2½ gpm at 40 to 50 psi are required per 1000 cfm.

Six dust precipitating principles are combined in the operation of this scrubber, and proportioning equipment delivers a solution called Compound M to the precipitator elements. This solution, diluted with water, wets the solid particles in the gases, and the dust which ordinarily repels water. Dust removed from the air is reduced to a watery sludge which can be discharged into a tank or pond. A recirculating system can be used where desired. Details on construction and operation of this dust removal system are available. Johnson-March Corp.

38—EXHAUST SILENCERS curb high, low frequency noise

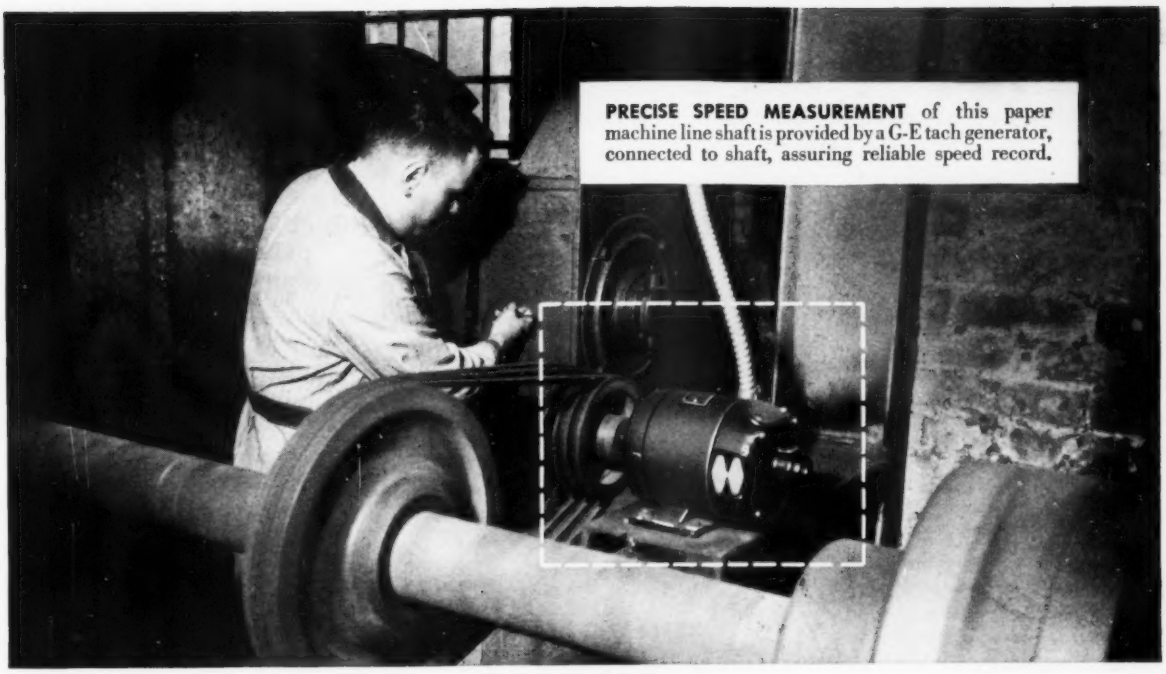
For noise control in critical and non-critical areas, the Series ADS Acoustic Discharge Silencers are designed to eliminate high and lower frequency noises caused by high velocity discharges from steam and air devices. They are used on steam vents and safety valves, hogging jets, gas turbines, air nozzles, evacuating ejectors. Three models will be available: ADSO for optimum silencing in critical areas; ADSS for light industrial areas, and ADSC for commercial silencing in non-critical areas, all in standard 8- to 30-in. pipe size. Further information is in Bulletin 265. Burgess-Manning Co.

39—LIGHTWEIGHT HOLDER for welding thin metals

A new water-cooled Heliweld Holder, the Airco H12A, is offered for welding thin gages of aluminum, stainless steel, copper base alloys, magnesium and killed steel. Its light weight—only 4 oz—permits continuous use with minimum operator fatigue, manufacturer points out,

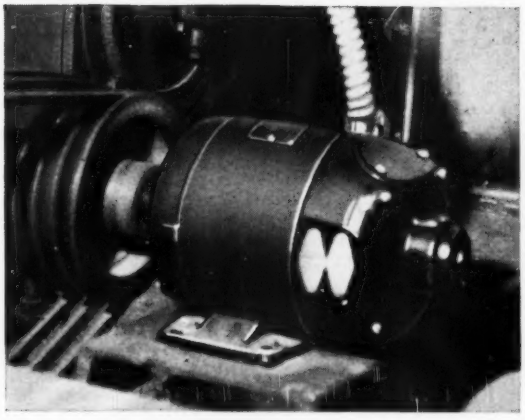
and its compact 7½-in. length affords maneuverability in hard-to-get-at corners. The tool's insulation material is a tough plastic designed to stand rough treatment.

Other features announced for the holder include interchangeable electrode caps—2-, 3- and 7-in. lengths, and an assortment of ceramic nozzles designed to prevent arc-shorting in tight spots. The Airco H12A is rated at 125 amp and can be operated on a-c or d-c power. It is specifically intended for manual Heliwelding in aircraft, automotive and other



PRECISE SPEED MEASUREMENT of this paper machine line shaft is provided by a G-E tach generator, connected to shaft, assuring reliable speed record.

Get closer process control by measuring speed with G-E tachometer generator



G-E TACHOMETER GENERATOR connected to an indicating or recording instrument provides one of many accurate control systems obtainable with G-E d-c products.

A precise speed measuring method—using G-E tachometer generators—is one of the many advantages you get from General Electric d-c motors. The tach generator (shown at left) can be located as far as several thousand feet from a recording or indicating instrument. They indicate rotational speeds from 1 to 15,000 rpm . . . permit immediate manual speed adjustment.

BECAUSE ONLY D-C MOTORS can be controlled over a wide range of characteristics like speed, torque, voltage, etc., more and more G-E d-c products are being used to assure maximum utilization of expensive modern machinery. You can get efficient, more automatic, modern production with G-E d-c products such as the tachometer generator above, d-c motors, motor generator sets, amplidynes, and thy-mo-trol* motors.

USE D-C MOTORS for maximum efficiency, and remember that General Electric's Application and Sales Engineers can help you select the right d-c motor for the job to be done.

For more information, see your local G-E Apparatus Sales Office or Authorized G-E Distributor. General Electric Company, Schenectady 5, N. Y. 704-11

*Reg. Trade-mark of General Electric Co.

You can put your confidence in—

GENERAL ELECTRIC

For more facts circle 601 on Reply Card

PACKAGED V-BELT FAN UNITS

BETTER FOR MANY AIR HANDLING APPLICATIONS

NEW! CLARAGE DEVELOPMENT

Clarage Ready Units are a notable advance in "packaged" fan units — highly efficient, compact, quiet in operation. And, like all other Clarage equipment, you can RELY on them for dependable, economical service.

MOTOR DRIVEN ASSEMBLIES—NO EXPENSIVE FOUNDATIONS REQUIRED

Clarage V-belt Ready Units come in 18 sizes—capacities to 12,000 c.f.m. . . . ECONOMY ANSWER to both INDOOR and OUTDOOR industrial air handling requirements.

Use Ready Units and save the expense of separate motor foundations. Use Ready Units and eliminate alignment problems. Use Ready Units for installations at lowest cost consistent with quality fan equipment.

Ready Units with or without Outdoor Covers shipped immediately. Special units for handling corrosive gases, etc., take longer.

INDOOR JOBS

Standard Ready Units (except three largest sizes) afford protection to fan bearings, motor and drive as shown below.

WRITE FOR READY UNIT CATALOG 515

— a twenty-eight page book, giving descriptive details, capacities and dimensions on the most modern "packaged" fan units available today. No obligation — address, CLARAGE FAN COMPANY, Kalamazoo, Michigan.

OUTDOOR JOBS

Cut below shows Ready Unit equipped with (easily removable) Outdoor Covers shielding all working parts from rain and snow.

68 PAGES OF VALUABLE INFORMATION

New Manual shows how to properly install and service Clarage fans, blowers and air conditioning units . . . valuable information adaptable to almost any type of fan job. Sent without charge to factory executives, engineers and maintenance officials.

You can Rely on...

CLARAGE

Headquarters for Air Handling and Conditioning Equipment

SALES ENGINEERING OFFICES IN ALL PRINCIPAL CITIES • IN CANADA: Clarage Fans, Ltd., 4285 Richelieu St., Montreal

For more facts circle 602 on Reply Card

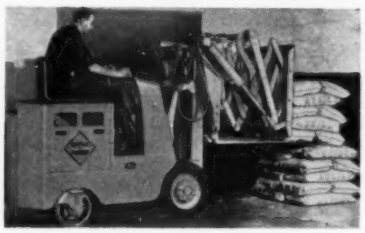
NEW PRODUCTS

(Begins on page 156)

industries. Details on this holder and other Heliwelding equipment are given in Catalog 2300. Air Reduction Sales Co.

40—PUSHER ATTACHMENT for palletless handling

For use on hydraulically actuated fork trucks, this hydraulic pusher provides a means for mechanically pushing a load off a truck's forks and is designed principally for handling loads without pallets. According to manufacturer, the attachment does not reduce the capacity of a truck. The pusher unit consists of a ver-



tical load screen guided by a pantograph. Power to extend and retract the screen is supplied by a telescoping double-acting hydraulic cylinder acting through thrust arms. The use of such a cylinder gives more stroke with less over-all height, it is noted, permitting tiering in low overhead areas.

The mechanism for the pusher is mounted alongside the truck's uprights, so the possibility of damage during travel is minimized. The screen can be made from bar, screen wire, pipe, as required. The Elwell-Parker Electric Co.

One of these products may be "just what you're looking for." Use the handy Reader Service Cards to ask for more information on it.

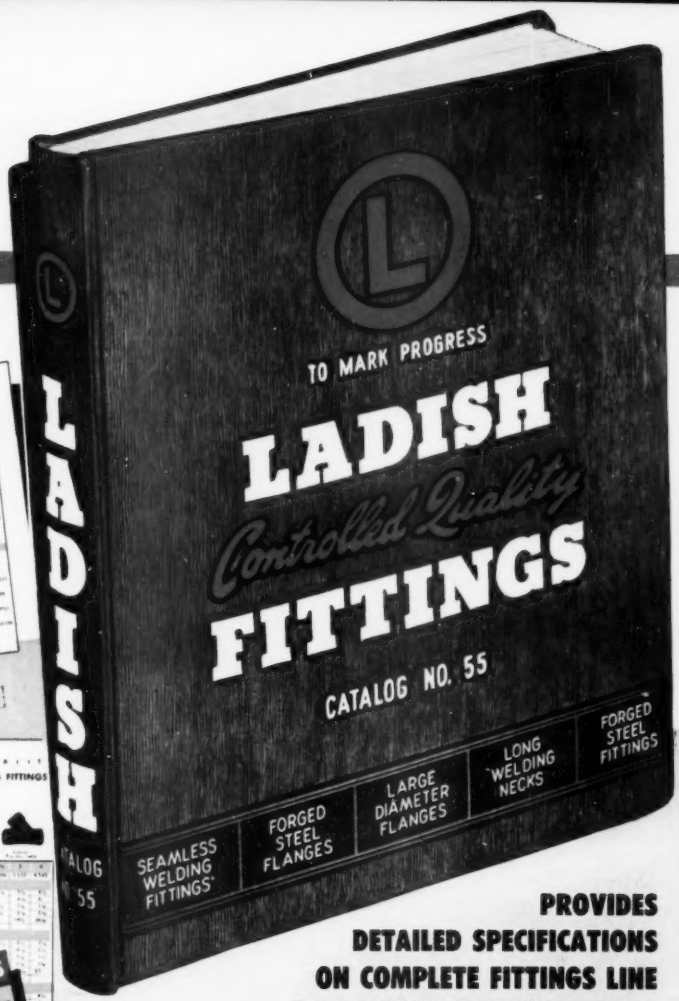
41—MOTOR offers better ventilation and protection

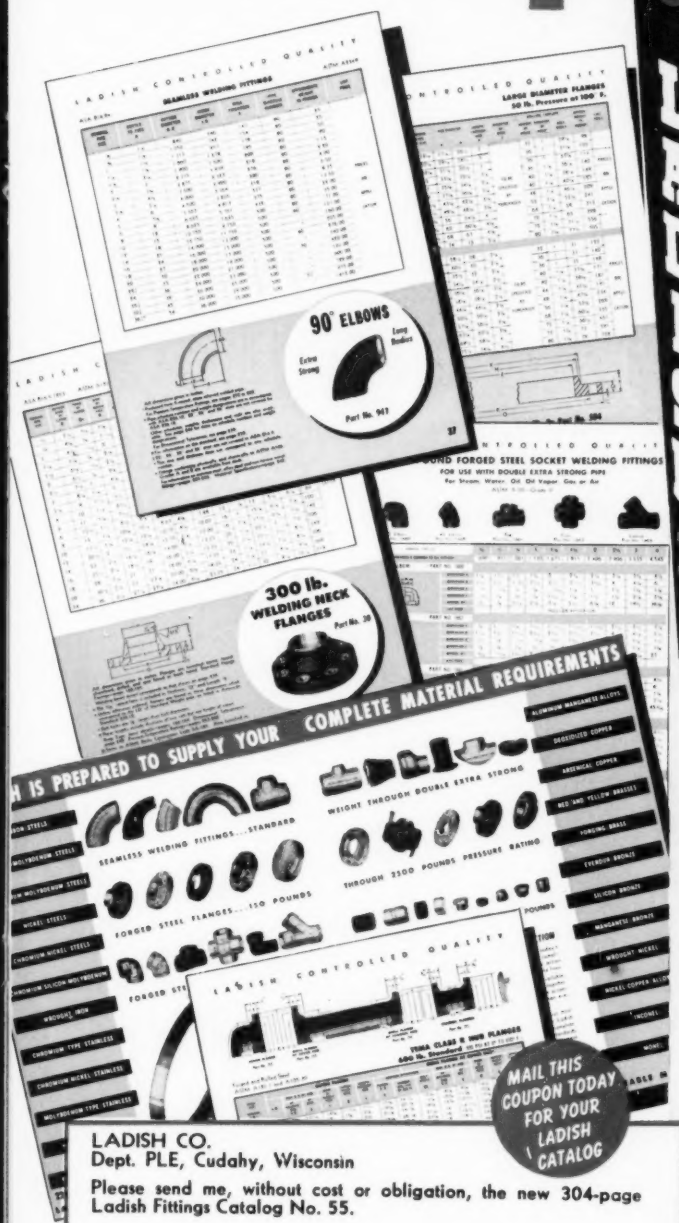
The Uniclosed Type H is a new motor conforming with NEMA specifications. By holding tolerance to closer limits and improving electrical characteristics, company has made this motor more compact than previous models. An outstanding feature announced is the dripproof design. The frame is one-piece cast iron and the stator is pre-wound. Frame sizes 182-184 are now available.

Among new details of the motor are end brackets with air intakes so arranged as to prevent intrusion of water, yet allow liberal air flow into the motor for two-way ventilation. Baffles within air vestibules of the end brackets are designed to prevent splashings from entering and coming into contact with the windings. The asbestos-protected windings have been reinforced and strengthened

For more facts circle 603 on Reply Card →

SEND FOR YOUR NEW 304-PAGE LADISH FITTINGS CATALOG NOW





PROVIDES DETAILED SPECIFICATIONS ON COMPLETE FITTINGS LINE ...PLUS USEFUL TECHNICAL DATA

Here are detailed dimensions, weights and specifications to assist in selecting proper fittings for any application... plus useful engineering and technical data. Major sections include:

68 PAGES BUTT WELDING FITTINGS
Available in Standard through Double Extra Strong weights... in sizes ½ through 42 inches.

56 PAGES FORGED STEEL A.S.A. FLANGES
Available in 150 through 2500-pound pressure ratings ... in sizes ½ through 24 inches.

20 PAGES LARGE O.D. AND T.E.M.A. FLANGES
Available in a complete range of types and pressure ratings... in sizes up to 160 inches in diameter.

7 PAGES LONG WELDING NECK FLANGES
Available in 150 through 2500-pound pressure ratings ... in sizes from 1 through 24 inches.

5 PAGES FORGED WELDLESS ROLLED RINGS
Available in diameters up to 240 inches in a wide variety of forged contours... in weights up to 40,000 pounds.

20 PAGES FORGED STEEL FITTINGS
Screwed and Socket-Welding types in 2000 through 6000-pound pressures, sizes ⅛ through 4 inches.

12 PAGES STAINLESS AND ALLOY FITTINGS
Featuring data on properties of materials and a comprehensive table of piping specifications.

56 PAGES TECHNICAL DATA TO SIMPLIFY PIPING DESIGN PROBLEMS

MAIL THIS COUPON TODAY FOR YOUR LADISH CATALOG

LADISH CO.
Dept. PLE, Cudahy, Wisconsin

Please send me, without cost or obligation, the new 304-page Ladish Fittings Catalog No. 55.

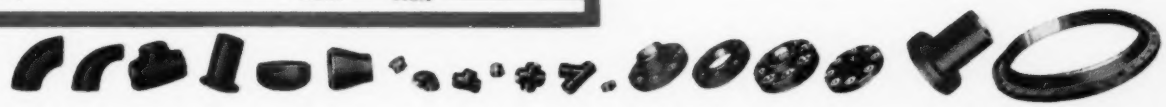
Name _____

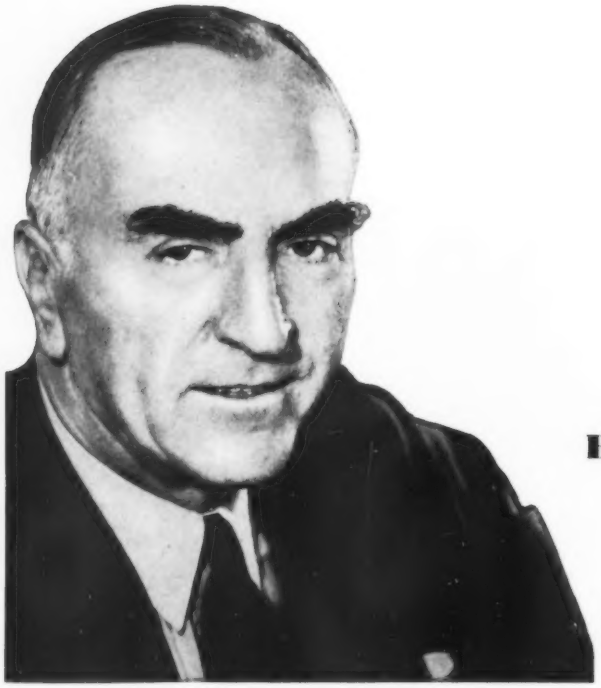
Title _____

Company _____

Address _____

City _____ Zone ____ State _____





"At Eastern Air Lines our key men in operation, maintenance, sales and management rely on

BUSINESS PUBLICATIONS

to help keep us abreast of industrial developments and business trends."

Capt. Eddie Rickenbacker
Chairman of the Board and General Manager, Eastern Air Lines

In an industry beset with red ink, Eastern Air Lines has shown a profit every year since the Captain took over the controls. The fact that Captain Rickenbacker and the stalwart Eastern team of executives, engineers, pilots, traffic experts and weather wizards who back him up read their Business Publications page by page, issue by issue, is a tribute to the editing and publishing skill of this great group of periodicals.

Like Captain Rickenbacker and his associates, other business and professional leaders throughout the country are depending on the business publications which cover their own fields to bring them vital news of products, methods, markets and men. They look upon the Business Press as a superbly organized intelligence service covering dozens of specific fields. Each issue of a business publication is a special report. Because these men who influence buying read business periodicals eagerly and thoroughly, the advertising pages of the Business Press form a *direct sales channel for products and services that are sold to business and professional men.*

NBP

The United Business Press

NATIONAL BUSINESS PUBLICATIONS, INC.

1001 FIFTEENTH STREET, N. W. • WASHINGTON 5, D. C. • STerling 3-7535

The national association of publishers of 162 technical, scientific, industrial and professional magazines, having a combined circulation of 3,524,478 . . . audited by either the Audit Bureau of Circulations or Business Publications Audit of Circulations, Inc. . . . serving and promoting the Business Press of America . . . bringing thousands of pages of specialized know-how and advertising to the men who make decisions in the businesses, industries, sciences and professions . . . pinpointing your audience in the market of your choice. Write for complete list of NBP publications.

Parlon Stays On!

Withstands coolants and lubricants...

One of the huge 84" machining lathes used to finish generator shafts in the Large Steam Turbine-Generator Department of General Electric Co. in Schenectady receives a coating of a chlorinated-rubber base paint.

Where coolants and lubricants are used in heavy machining operations, Parlon (chlorinated rubber) based finishes are giving protection far superior to that which can be obtained by standard paints. Because Parlon stays on—*and stands up*—a single coat has been found to provide, in many instances, ample coverage and full protection for an entire year.

Parlon finishes have proved that a paint doesn't have to be dull and drab to be serviceable . . . that if conditions demand it, a tough, well-anchored coating can be obtained without extensive surface preparation or costly application techniques. Make your next maintenance painting job a Parlon job, for improved appearance and lower long-term plant costs.

Cellulose Products Department HERCULES POWDER COMPANY *966 Market St., Wilmington 99, Del.*

LOOK FOR THIS LABEL ON THE PAINT CAN...

MADE WITH
Parlon®
HERCULES® CHLORINATED RUBBER

PARLON CHLORINATED RUBBER PAINTS ARE AVAILABLE FROM 400 MANUFACTURERS UNDER THEIR OWN BRAND NAMES

For more facts circle 605 on Reply Card

First Again!

Mobil-Matic MOBILIFT

with OIL-SMOOTH Constant-Mesh Transmission

Engineered Especially for FORK TRUCKS

For years Mobilift users have benefited by Mobilift "firsts". Mobilift consistently sets the trend in bringing engineering progress to the field of fork lift trucks. Every part of a Mobilift is designed and built for rugged use and to give maximum performance at the lowest operating costs.

First with an Oil Immersed Multiple Disc Clutch especially designed for fork trucks.

First with Lev-R-Matic — No Gear Shift... No Clutch Pedal ...ONE-Lever Control.

First with FREE LIFT to give maximum lifting height before inner mast raises.

First Again!

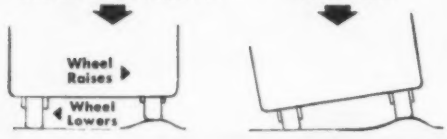
with Mobil-Matic DRIVE

The oil-smooth, high and low range, constant mesh transmission with fluid coupling to the Chrysler 6-cyl. engine. There's *NO CLUTCH PEDAL — just ONE direction selector lever.*

First with HYDRA-LIZER

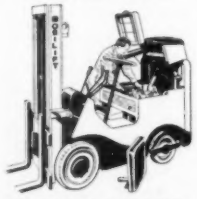
The hydraulic equalizer on the steering wheels for *cross-compensating* truck and load over bumps...

GIVES YOU THIS... NOT THIS



MODEL D-424

4,000-lb. cap. at 24" Load Center. 83" Mast, 128" lift, 64" Free Lift.



And FIRST with ONE-PIECE HOOD that raises easily for full access to engine compartment.

WRITE TODAY

for complete details on the New Mobil-Matic MOBILIFT or contact your nearest Lamson - Mobilift office.

MOBILIFT Mobil-Matic LAMSON MOBILIFT CORPORATION

835 S. E. MAIN STREET · PORTLAND 14, OREGON

• 2317 W. 18th, CHICAGO • 790 PATTERSON AVE., E. RUTHERFORD, N. J.
• 2724 TAYLOR ST., DALLAS • 1113 SPRING ST., N.W., ATLANTA
• 2730 SAN PABLO AVE., BERKELEY

For more facts circle 606 on Reply Card

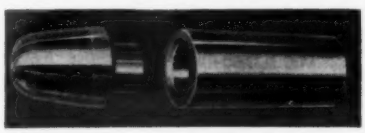
NEW PRODUCTS

(Begins on page 156)

by addition of Mylar laminations. Lubriflush lubrication of bearings is incorporated, and air impeller blades on the rotor ends have been redesigned for more quiet operation. According to manufacturer, the Uniclosed Type H meets same standards as its former type in temperature rise, and torque, etc; and the overload capacity has not been reduced. U. S. Electrical Motors, Inc.

42—RECAP TIPS and adapter shanks for welding

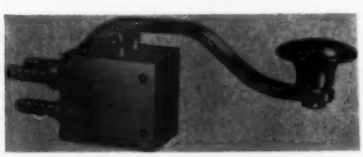
In addition to providing a double water seal and being made out of high conductivity alloys, these new recap tips and adapter shanks are announced as offering several advantages: The welding face of



the tip can be ejected without removing the entire electrode from the holder. Electrode cost is reduced in numerous applications, and electrode dressing cost and downtime on equipment is saved in high production shops. Because of its taper length, the insert can be used in dies and in many restricted places where clearances are inadequate to permit a standard tip. Ampco Metal, Inc.

43—FOUR-WAY VALVE has an extra light touch

The FT-4 Fingertip Valve is a new four-way valve similar to company's three-way valves. Openings are ¼ in. pipe thread, giving ample speed for most applications with air cylinders up to 3-in. bore. Because of its light touch, this



valve's operation has been likened to that of telegraph keys, manufacturer points out, only about ⅛-in. movement being required from full open to closed position. The lever returns to starting point after each release, it is noted, and twin mounting holes on top and sides make the valve easy to mount in any position. Mead Specialties Co.

44—METER, electromagnetic, for conducting liquids

The Xactronic is an electro-magnetic flow meter for measurement of a wide variety of conducting liquids—water and aqueous solutions, acids and other corrosives, slurries, emulsions, liquids containing solids in suspension, molten salts and liquid metals. High pressures and temperatures or high concentration of sus-

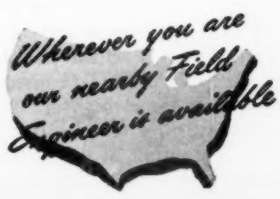
when industrial turbo-generators go bad National gets them back to work FAST

When unexpected turbo-generator failure cripples your operations, call National. Your generator will be back on the job in a hurry. Delivery of the rewound unit, or of the necessary rewinding materials, can be made with startling speed because all of the wire and insulating materials used in your windings are fabricated right in the National plant.

National facilities for servicing industrial turbo-generators include large lathes, balancing machines and other tools for mechanical repairs as well as complete equipment for the production of rotor and stator windings. But the big plus value in National service is "know-how". Skilled workmen who know that careful coil installation can make a big difference in the service life of your generator. Engineers who know how to spot and correct the little defects which can bring you big savings in maintenance costs.

National stands for fast service. Yes, but not at the expense of quality. Frequently, in fact, National engineers are able to introduce modifications of design or materials that will make your generator better than ever. "As good as new" is not good enough for National. That's why National rewinding pays for itself so quickly.

No matter what kind of rotating electrical equipment you operate — if it's giving you trouble, call National.



NATIONAL ELECTRIC COIL COMPANY

COLUMBUS 16, OHIO, U. S. A.

ELECTRICAL ENGINEERS: MAKERS OF ELECTRICAL COILS AND INSULATION
REDESIGNING AND REPAIRING OF ROTATING ELECTRICAL MACHINES

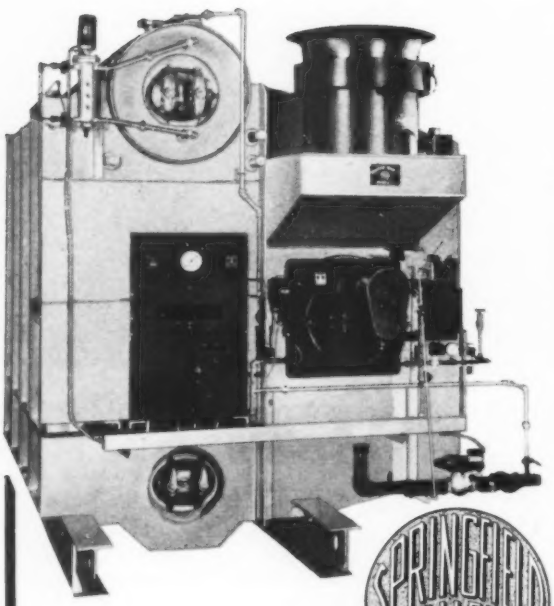
For more facts circle 607 on Reply Card

Ahead in Design!

SPRINGFIELD

WATER TUBE

PACKAGE BOILERS



1. Rugged 2-Drum, Bent Tube "Power Plant Type" design. No headers, no handholes, no wasted weight. Unrestricted circulation.

2. Complete "6 wall" furnace cooling for greatest capacity. Permits higher heat release rates with lower actual "heat loading" of tubes.

3. Dry Steam — steaming tubes discharge above top drum water level.

4. Exclusive gas-tight, insulated, double-cased steel jacket. Sectional construction makes all tubes easily accessible and replaceable without necessity of tearing out and repairing side wall setting.

5. Pressurized firing. No induced draft fan or tall stack required. Indoor or outdoor installation.

6. Efficiency — over 81% with oil. Automatic, semi-automatic, or manual control. Gas, oil, or combination firing. Underwriters' approved.

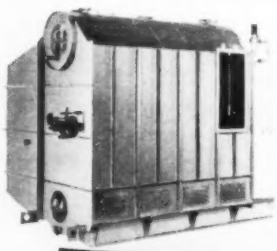
7. Widest choice of sizes. All compact, portable. Design pressures of 200, 300, 600, and 900 psig. Superheat to 200° available.

SPRINGFIELD BOILERS

QUICKER, EASIER INSTALLATION!

When you compare quotations for package boilers, check all of the *additional values* Springfield gives you! Make sure you are getting a COMPLETE UNIT ready to connect to fuel, water, electrical, and steam lines — with *no extras* required for setting and other materials.

Springfield Package Boilers are unique in that the basic design is actually the same as a large power plant boiler — consequently, they can be built for as high as 900 psig. operating pressure. These units are also excellent for generation of high pressure — high temperature hot water. *Send for complete information.*



12 DIFFERENT SIZES

6,000 12,000 18,000 24,000 30,000 36,000

9,000 15,000 21,000 27,000 33,000 39,000

POUNDS OF STEAM PER HOUR Guaranteed Capacity

SPRINGFIELD BOILER CO.

Founded in 1890

A DIVISION OF John W. Hobbs Corporation

1911 East Capitol Avenue • Springfield, Illinois

Ask for Latest Catalog

For more facts circle 608 on Reply Card

NEW PRODUCTS

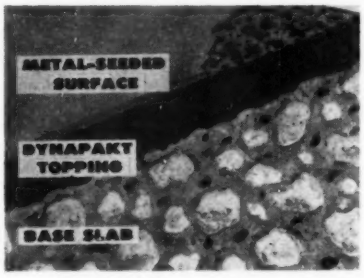
(Begins on page 156)

pended matter present no obstacle, says manufacturer.

The metering element is compact and simple, consisting of an enclosed magnet, stainless steel tube with Teflon liner and attached electrodes which are connected to the indicator or recorder remotely installed wherever desired. It is pointed out that there are no moving parts, that the metering element cannot become clogged since there is no constriction, and that pressure drop through the metering element is no more than that of an equivalent length of pipe. Accuracy of the meter is rated at ±1 per cent. The instrument scale is linear. Six sizes from ½ to 2 in. are available. Bowser, Inc.

45—FLOORING PROCESS utilizes metal aggregate

Metal-Seeded Dynapakt, a new industrial flooring process, is said to add the strength of iron to heavily-traveled concrete floors. Warehouse, machine shop, or shipping floors subjected to rolling and skidded loads are suggested locations



for it. With this process, company installs a ⅛-in. "veneer" of iron-chip aggregate as a non-spalling, non-crumbling, nonslip armor over fresh Dynapakt concrete topping. The flooring operation is performed with heavy-duty power equipment to assure maximum compaction and adhesion of concrete and metal. Spalling and delamination are said to be eliminated with Metal-Seeded Dynapakt because of intimate interfacial anchorage. Flash-Stone Co., Inc.

46—LOCKING CHUCK is designed for greater safety

An outstanding feature of the P.R.O. Chuck is its safety factor. It remains locked in closed position until opened by the operator, says manufacturer, and neither centrifugal force nor power failure will cause release of the work as the chuck is revolving on the machine spindle. The body of the chuck is slotted radially to accommodate the jaws, moved in a radial direction by bell cranks.

The sleeve is moved by the draw stud acting through a set of locking blocks, which are inserted in a small inner sleeve and engage in an internal taper on the movable sleeve. Locking action is produced by the wedging of these blocks against a tapered plug inside the

Make your own comparison of the

Gilmer THE ORIGINAL "TIMING"® BELT DRIVE

versus other forms of Power Transmission

	GILMER "TIMING" BELT DRIVE	FLAT BELTS	CHAIN	V BELTS	GEARS
1. Can it transmit 1/100 to 300 HP without slippage . . . and without lubrication?	Yes	—	—	—	—
2. Does it eliminate noise and vibration caused by metal-to-metal contact?	Yes	—	—	—	—
3. Does it operate at maximum efficiency, indefinitely, without take-up?	Yes	—	—	—	
4. Does it make possible very compact, short-center drives of ratios up to 15-to-1?	Yes	—	—	—	
5. Does it eliminate need for initial tension, permitting all the drive's tension to be used effectively . . . and reducing bearing wear?	Yes	—	—	—	
6. Can it operate satisfactorily at peripheral speeds above 12,000 FPM?	Yes	—	—	—	
7. Does it maintain constant angular velocity?	Yes	—	—	—	
8. Is its weight very low in proportion to its strength?	Yes	—	—	—	
9. Does it make possible precise "timing", without appreciable backlash, between two or more widely separated shafts?	Yes	—	—	—	
10. Does it eliminate the expense and added weight of lubricants, lubricating devices and covers?	Yes	—	—	—	
11. Does it save so much power as to sometimes permit use of lower-powered motors?	Yes	—	—	—	
12. Does it have unusually long, maintenance-free service life?	Yes	—	—	—	

WHEN PLANNING A DRIVE, CONSIDER ALL FIVE!

NEOPRENE-ENCASED, CABLED STEEL WIRE GIVES THE BELT GREAT STRENGTH WITHOUT BULK

Naturally, these questions are phrased to emphasize the unique *combinations* of features provided by the "Timing" Belt drive. Question 1, for example, might have been divided into two separate questions. But this would not point up the important fact that the "Timing" Belt drive is the *only positive drive requiring no lubrication.*

Certainly, the four older types of drives will always have their special places in the power transmission picture. The important fact is that the plant engineer, like the design engineer, now has at his disposal a *fifth* type of drive ideally suited to so many applications that more than a million are now in use. Write, or ask your NYB&P Distributor for your copy of the Gilmer "Timing" Belt Stock, Drives Manual.

NYB&P — NEW YORK BELTING & PACKING CO. (Founded 1846) 1 Market St., Passaic, N. J.

America's Oldest Manufacturer of Industrial Rubber Products

For more facts circle 609 on Reply Card

When should a circuit breaker ••• be a circuit maker?

Interruption of short circuits and overloads is but part of a circuit breaker's job.

Equally important is the task of keeping power flowing through the line . . . safely . . . without needless stoppages.

Here's how Heinemann Circuit Breakers serve better in *both* functions. When current in the line reaches or exceeds ten times rating, the Heinemann Circuit Breaker opens the circuit instantly . . . faster than any comparable device available today. On lesser overloads, it responds with precise, proportioned time delay, allowing for normal inrush and temporary, harmless overcurrents . . . thus preventing unnecessary service stoppages.

The hydraulic-magnetic operating principle further qualifies the Heinemann Circuit Breaker in its role as a better circuit *maker*. Because tripping points and current capacity remain constant regardless of ambient temperature, this principle permits safe use of full current capacity—summer and winter, in hot or cold locations—without de-rating or any form of temperature compensation. And, since no thermal elements are employed, nuisance interruptions due to ambient heat are eliminated.

Heinemann Circuit Breakers offer other advantages, too, in both convenience and economy. No reset is required. After a fault is cleared, service is restored simply by returning the handle to the ON position. And, because Heinemann Circuit Breakers have the lowest wattage loss, power is saved continuously throughout all the years of service.

INFORMATIVE LITERATURE AVAILABLE: For the straight facts, send for your copy of "What You Should Know About Circuit Breakers." Just ask for Manual 101.

HEINEMANN ELECTRIC COMPANY
128 Plum Street • Trenton 2, New Jersey

HEINEMANN Circuit breakers

For more facts circle 610 on Reply Card

NEW PRODUCTS

(Begins on page 156)

movable sleeve. This plug is one-half that of the movable sleeve, so the blocks are wedged until positively released by the draw stud. The tapers are calculated to produce a constant bearing with the blocks for the entire movement of the inner sleeve, it is explained, and when the chuck is in gripping position, the blocks are initially in parallel contact with the movable sleeve and plug. As the chuck revolves, centrifugal force on the jaws, causes the blocks to exert a maximum locking force. The Logansport Machine Co.

47—STEAM CLEANER has water level, pressure control

Portable, and having automatic water level and pressure control, the Spontane Steam Cleaner features Hydro-Therm flow, a pre-heating arrangement said to enable this unit to convert cold water to 80 psi steam in 45 sec. Water is heated to approximately 180 F before entering the tank. Cleaning compound,

mixed by continuous agitation in the heated water, dissolves rapidly for maximum detergency.

The cleaner operates at steam pressures from 80 to 125 psi, independent of city water pressure. Construction of the Spontane reduces the hazard of fire to a minimum, it is explained, because the automatic ignition eliminates use of matches or lighted torches, and drippings from the pumps and burner cannot drop on the floor or area where the machine is operated. The Spontane has wide cleaning applications, including degreasing, sterilizing and disinfecting operations. Turbo Machine Co.

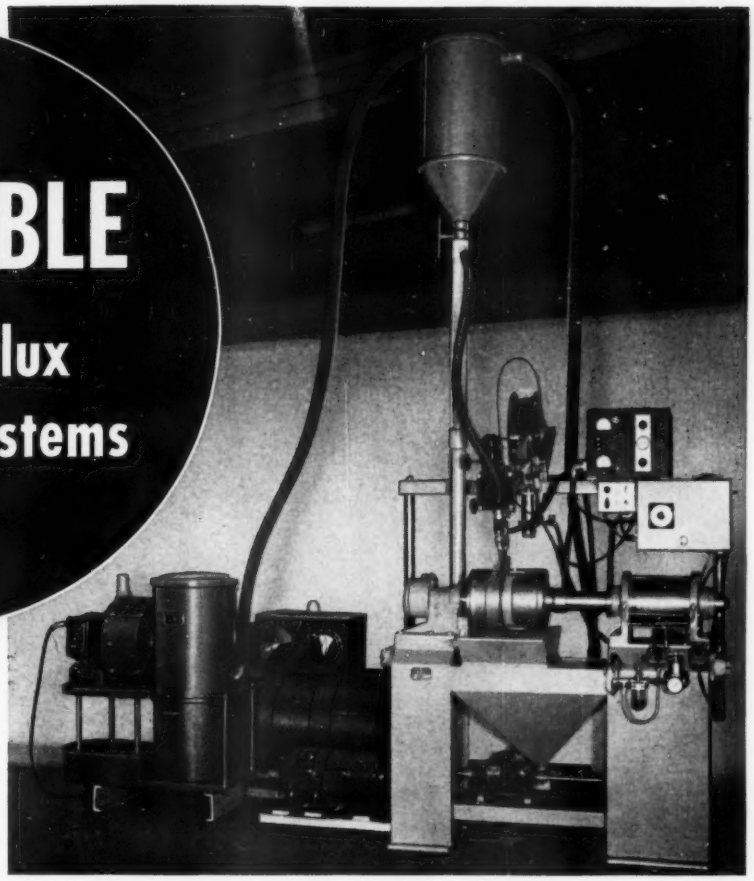
48—SWITCH DEVICE for detecting thread breaks

Designed to improve thread handling and wire cabling machinery, this detector consists of a mercury switch assembled in a simple wire-form actuator. "Eyes" are provided on each end, one for attaching the device to the thread or wire cable, and the other for supporting the unit on a pivot, which may be a simple hook.

Two wire forms are provided, so the mercury switch can be held in an open or closed position. In event of strand

INVINCIBLE

Welding Flux Recovery Systems



This compact set-up includes a primary separator tank and standard Model 460 unit. Compressor parts for a large refrigerator manufacturer are being welded.

Pay for themselves . . . with interest!

Thousands of Invincibles are at work throughout industry . . . salvaging valuable welding flux, saving labor, making the welding operation more efficient. Invincibles repay their cost in a short time, then pay an additional service bonus.

If you have a submerged arc welding job, consider these features of Invincible Flux Recovery Units:

1. Invincibles save valuable flux by recovering *all* loose flux from the work, removing slag or fused particles, and returning the unfused flux to the hopper of the welder. Both manual units and completely automatic (continuous flow), systems are available.

2. Invincibles save costly man-hours—release men for other important work. Invincibles do the job automatically, more rapidly and efficiently than manual methods.

3. Invincibles save you money caused by rejects; by removing all fine dust (flux flour), they speed production and reduce welding rejects.

These Invincible advantages can be applied to your job, regardless of its size or type. Let us send you this *Free Folder* on Flux Recovery. Illustrated case histories show how Invincibles save time and money on installations of all kinds.

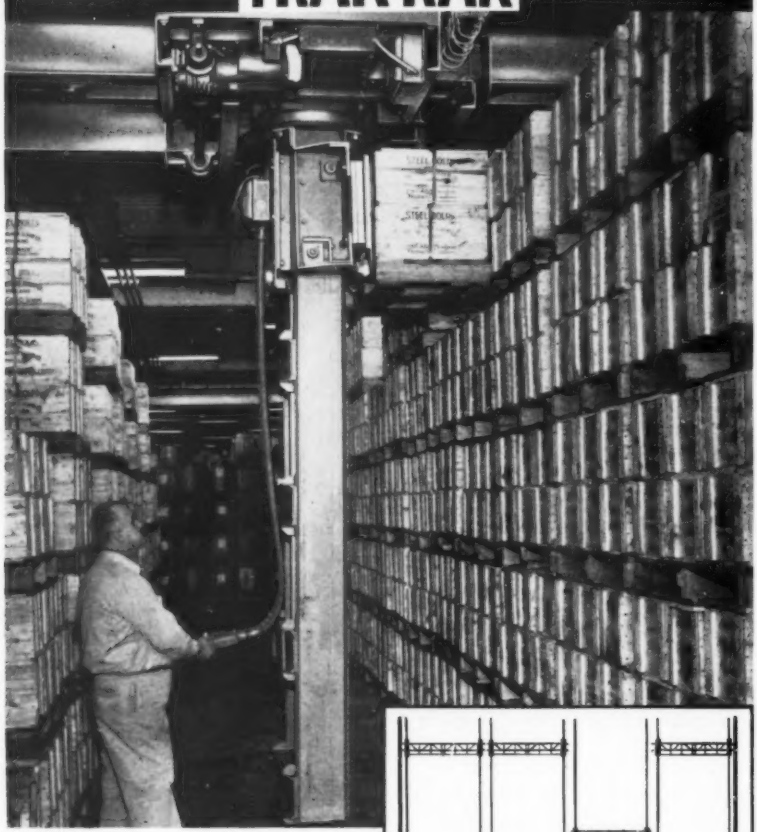
INVINCIBLE VACUUM CLEANER MFG. CO.

DOVER, OHIO

OVER 30 YEARS THE LEADER IN INDUSTRIAL VACUUM EQUIPMENT

For more facts circle 611 on Reply Card

85% More Storage Space with CHICAGO TRAMRAIL TRAK-RAK STORAGE SYSTEMS



TRAK-RAK Interlocking Transfer System which permits two hoisting columns to serve four bays.

The Chicago Screw Co. increased pallet storage over 85% in the same storage space in each of four bays with TRAK-RAK Crane System, storing 2100 pallets in the same space formerly required for 1120 pallets.

The Chicago Screw Co. also saved many man hours due to the simplicity and maneuverability of the TRAK-RAK System which allows accurate placing of materials in and out of the storage area.

The original installation served an approximate area of 9,000 sq. ft., with an interlocking transfer system which allows the movement of the hoisting columns from one bay to another. Due to the extreme flexibility of TRAK-RAK Systems, additions can be readily made in most installations. Since the original installation, The Chicago Screw Co. has added a fourth bay which interlocks with the three previous bays.

This system is an under running transfer system; however, TRAK-RAK Systems can also be furnished as top running or self-contained systems operating on rails mounted directly on top of the racks.

ASK FOR COMPLETE INFORMATION... descriptive catalog, pictorial record of various applications and engineering data.

CHICAGO TRAMRAIL CORPORATION
4000 West Washington Boulevard • CHICAGO 24, ILLINOIS

For more facts circle 612 on Reply Card

NEW PRODUCTS

(Begins on page 156)

breakage, the unit tilts, opening or closing the circuit which shuts the machine or sounds an alarm. The open pivot mounting keeps the device lint free, it is noted, and the seal of the mercury switch also serves to prevent lint or dust from interfering with electrical contacts. The detector can also be used in slack strand detection. Micro Switch, Div., Minneapolis-Honeywell Regulator Co.

To receive product data circle item numbers on the handy Reader Service Cards on pages 35-36 and 119-120.

49—MOBILE TOOL STAND has cabinet, two drawers

Model 426, a mobile tool stand for use in assembly, inspection and maintenance, has been added to the manufacturer's Hallowell Carry-Tool line. It is made of heavy gauge steel and mounted on 2½ in. swivel casters; has a cabinet and two drawers, with the top a recessed tray. Over-all dimensions of the stand are 18

by 24 in. by 35¼ in. high. The cabinet is 14 in. high, has a door with chrome locking handle. Each drawer is 5 in. high, has roller suspension and individual padlock attachment. The stand is finished in baked-on green enamel. Standard Pressed Steel Co.

50—WIRE ROPE HOIST for intermittent duty

A light service, quick action wire rope type hoist, the Lift About-Jr., is available in ¼- to 1-ton capacities with a-c or d-c motor. It can be supplied with collectors for regular conductor systems or with a tag line; comes either parallel or cross mounted, with bolt, hook, or trolley suspension. Speeds range from 12 to 25 fpm on d-c operated types; 20 to 37 fpm on a-c operated units. Maximum lift is 16 ft on hook suspension units, 20 ft on all other frame sizes. Hoists may be had for push button or rope operation.

The Lift About-Jr. uses a combined electric brake and control, two magnets

HUSH!
HUSH!
Here at Sacramento, California, Aerojet-General Corporation manufactures highly specialized Rocket Engines for the U. S. Armed Forces.
Every project at this Aerojet Plant has a Secrecy Classification.
But... It's no secret that all production machines in this plant use just one modern multi-purpose grease . . . Shell Alvania

The importance of superior lubrication in such a setup is obvious . . . but that's not all! Aerojet-General Corporation gets many other advantages from using just the one grease:

1. **Shell Alvania pumps *freely* in cold temperatures, yet will not run out of bearings under excessive heat.**
2. **It has extremely high oxidation stability.**
3. **It extends time between greasings . . . a substantial saving in labor and grease.**
4. **Simple inventory . . . just the one grease to stock and apply.**

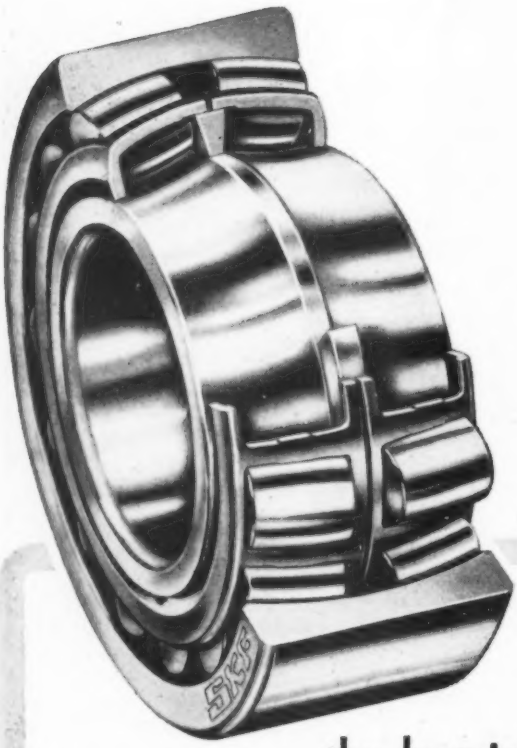
For further information on Shell Alvania Grease write to Industrial Lubricants, Shell Oil Company, 50 West 50th Street, New York 20, New York—or 100 Bush Street, San Francisco 6, California.

SHELL ALVANIA GREASE

The True Multi-Purpose Industrial Grease

SHELL

For more facts circle 613 on Reply Card



the bearing that

LIVES LONGER

comes from **SKF**

For your next replacement job, why not buy the spherical roller bearing that will *last* up to 3½ times longer than any other available design?

That's right—SKF's *improved* (Type "C") Spherical Roller Bearing *will* provide, size for size, 2 to 3½ times more life, and up to 50% increased capacity *. . . at no increase in cost.*

Your nearby SKF Distributor can show you how the original SKF Spherical design has been improved to reach this higher performance level, and, in the most popular series, can supply your requirements promptly from his stock. Remember—your SKF Distributor is a trained specialist in helping industry *put the right bearing in the right place.* **SKF INDUSTRIES, INC.,** PHILADELPHIA 32, PA.— *manufacturers of* **SKF** *and* HESS-BRIGHT® *bearings.* 7532

SKF®

BALL AND ROLLER BEARINGS

For more facts circle 614 on Reply Card

NEW PRODUCTS

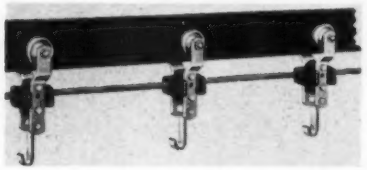
(Begins on page 156)

and contact sets, one for hoisting and one for lowering. A mechanical interlock between hoisting and lowering contactors prevents these units from operating at the same time. Other features include a safety type load block with fully enclosed sheave, weather proof enclosures, and oil bath lubrication. Shepard Niles Crane & Hoist Corp.

51—CABLE CONVEYOR designed for longer service

New design details incorporated in the Bush-Lock Cable Conveyor are said to increase cable life more than 30 times; to facilitate lubrication, and to permit fast, easy maintenance and revision of cable conveyor installations. Also, it is pointed out, the shorter radius horizontal and vertical curves permit a more compact layout. Both ¼ in. and ⅜ in. Bush Lock Cable Conveyors will operate on existing Snub-Lock systems.

As explained by company, the Bush-Lock trolleys feature cylindrical bushings locked on accurate centers by high pressure swaging to preformed galvanized or



stainless steel cable. Two halves of an adapter block, to which are attached the trolley and load-bearing hook, are bolted around the bushing. The increased service life claimed for this cable is attributed to rotary floating action of the bushing in the wide radius adaptor block and the fact that the bushing can be lubricated. Nine wheel types are available. The E. W. Buschman Co.

52—RUST PREVENTIVE to protect lubricating systems

Oilcoat T is a compounded oil with a non-metallic high potency additive to prevent corrosion and rust of metal surfaces. It is especially suggested for protection of machinery during shipment, storage or seasonal shut-downs.

In addition to its rust protection properties, the most outstanding characteristic announced for Oilcoat T is compatibility with machine lubricating oils. This compatibility feature is particularly important if the lubricating system is flushed with the same oil used for lubrication. The use of rust preventive that is not compatible may result in the development of precipitates in the lubricating oil and a shorter period of usefulness, it is explained.

This oil may be applied to metal surfaces by spraying, dipping or brushing. Because of its light viscosity it can be sprayed or circulated in a lubricating system and then drained. Gulf Oil Corp.

Protect yourself before you buy lighting fixtures!

This is an 8 ft. CFI DAY-LINE undergoing the critical inspection of a buyer of industrial lighting fixtures. We think this is a sound buying practice. We think it is the *essential* step in finding the most value for your money.

LOOK AT DAY-BRITE'S CFI DAY-LINE®...FEEL THE DIFFERENCE...BEFORE YOU BUY

There are more than 2,000 different makes of lighting fixtures on the market. Some of them are good values. Many, many more give you little but regrets, trouble and expense.

The odds are *against* you getting the most for your money. What can you do to protect your plant lighting investment? Day-Brite's answer is this:

Don't buy *any* lighting fixture until you put it before you, handle it yourself, take it apart, see how it's made, compare it with others. You don't need to be a lighting expert. If the value is there... you can *feel* it!

We are eager to have you make this personal, critical test on the CFI DAY-LINE or any other Day-Brite fixture. We know from experience that the value we build into the Day-Brite line tells its own story better than we can.

Whatever you do, take the time to protect your lighting investment. Take the time to look at and compare fixtures... *feel* the difference... yourself.

454

10% UPLIGHTING. Die-embossed apertures in CFI DAY-LINE reflector distribute 10% light up, 90% down for improved visual comfort. Vibration-proof TURRET* sockets are standard equipment.

*® G.E.Co.

PORCELAIN ENAMEL. Rugged, one-piece CFI DAY-LINE reflectors finished in snowy white, lifetime porcelain enamel—inside and outside. Resists acids and stains. Wipes clean quickly.

"DECIDEDLY BETTER"
DAY-BRITE
Lighting Fixtures

WRITE FOR BULLETIN OD-568.
Day-Brite Lighting, Inc., 5439 Bulwer Avenue, St. Louis 7, Missouri. In Canada: Amalgamated Electric Corp., Ltd., Toronto 6, Ontario.

SEE YOUR LOCAL ELECTRICAL CONTRACTOR

For more facts circle 615 on Reply Card

YOU'RE ALWAYS SURE of GREATER ECONOMY... with PREFERRED UNIT STEAM GENERATORS

With a Preferred "Packaged" heating unit you can be sure of—

1. A boiler designed for better performance, built beyond the codes, installed at lower cost.
2. A 25-year investment that pays for itself in one-fifth of its service life through more efficient steam production and greater fuel economy.
3. These Preferred quality features that make all the difference—

- Five Square Feet of Heating Surface per Boiler HP.
- Four-Pass Gas Travel.
- Anti-Stress Deck.
- Intermediate Furnace Position.
- Staggered Tubes.
- Down-Draft Design.
- Induced Draft.
- Expansile Precipitator.
- Dual Purging Action.
- Full Automatic Oil and/or Gas Burners.

Preferred Unit Steam Generators are available in sizes from 20 to 600 B.H.P. and pressures from 15 to 250 psi, to burn oil or gas or in combination.

All Preferred Unit Steam Generators are factory fire-tested before shipment.

GET THE COMPLETE STORY
WRITE FOR BULLETIN 2000

PREFERRED UTILITIES MFG. CORP., 1860 Broadway, New York 23, N. Y.
Dept. PL-2

☐ *Please send me Bulletin No. 2000*

Name_____

Position_____

Address_____

City_____ Zone_____ State_____

For more facts circle 616 on Reply Card

Design and Maintenance

(Continued from page 97)

and equipment. No longer can decisions for selection of either materials or maintenance methods be left entirely to the maintenance mechanics. Specialized knowledge and training are needed to evaluate through economic studies, equipment, materials and methods. Because of the transition from the simple to the complex another form of specialization is evolving in the form of maintenance engineering.

When we arrive at the "pushbutton" stage of automatization some maintenance workers may no longer be classified accountingwise as "indirect" but

"Higgins, you're fired. Turn in your safety pin."

as "direct" productive workers, since operators may be maintenance mechanics. During this period, management will have to revise its yardsticks for maintenance cost. The most common index is the ratio of maintenance hours to direct labor hours. Other indices are: maintenance cost to total sales dollars; maintenance personnel to manufacturing personnel; etc.

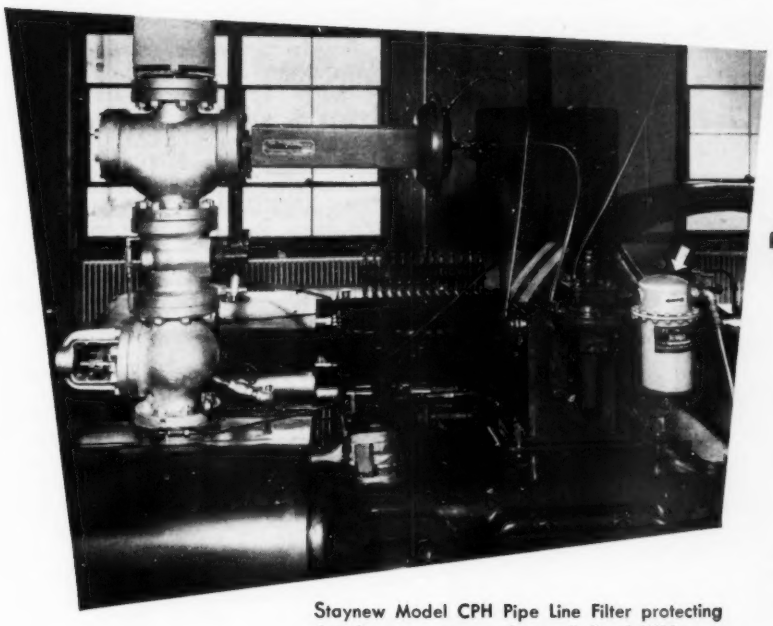
The administration of maintenance control varies between companies and even within the same company. There are several methods of administration controls each with certain advantages. Some of the categories of control are: central, unit, departmental, area and headquarters maintenance control. Basically there are two fundamental control methods: central and unit.

In central control all maintenance for the entire plant is under one head who is usually disassociated from all productive responsibility. Unit control places maintenance of production equipment closer to the production supervision of that unit. There may be several maintenance units within the same plant which are completely independent of each other.

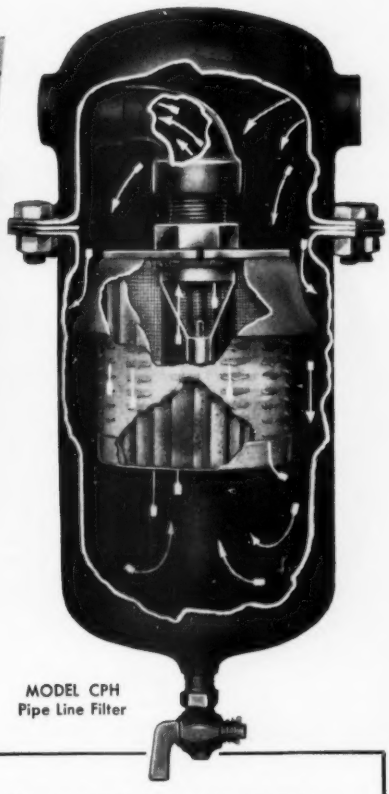
The strongest argument for unit control has been one of accounting and cost control. It has been held that

STAYNEW PIPE LINE FILTERS

HELP KEEP THE PLANT OPERATING GROUP HAPPY



Staynew Model CPH Pipe Line Filter protecting throttling governor on Ingersoll-Rand XPV compressor at Long Island Lighting Co., Riverhead, L. I.



MODEL CPH
Pipe Line Filter

Failure to provide proper filtration can cause delays and breakdowns due to accumulation of rust, scale, foreign particles and condensed oil in pipe lines. This disrupts the cycle of production resulting in lost time and damaged materials.

Due to sound engineering design and construction, Staynew Pipe Line Filters give dependable day in and day out performance with minimum of maintenance . . . prolong the life of your equipment and help keep the plant operating group happy.

For quick action let our Engineering Department help solve your filtration problems. Write today for Bulletin B-1A.

USED ESPECIALLY FOR

- AIR OPERATED INSTRUMENTS
- AIR OPERATED TOOLS
- PNEUMATIC CONTROLS
- INDUSTRIAL PROCESSES

Representatives in principal cities.

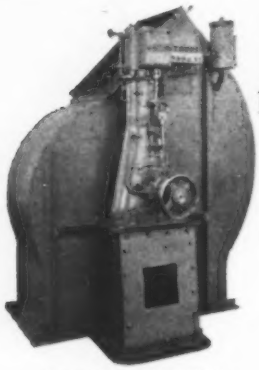
DOLLINGER REG PROTECTOMOTOR U.S. PAT. OFF. STAYNEW FILTERS

DOLLINGER CORPORATION

55 Centre Pk., Rochester 3, N. Y.

ALL TYPES OF FILTERS FOR EVERY INDUSTRIAL NEED

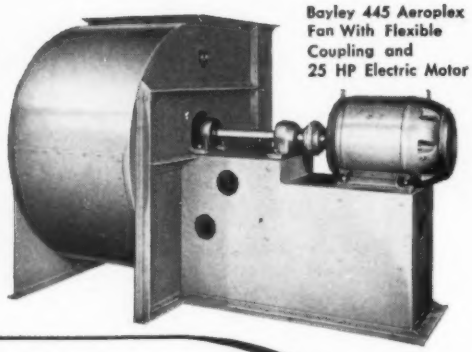
For more facts circle 617 on Reply Card



Bayley Among
The "FIRST"
IN FAN DESIGN
BACK IN 1914

Early Model of BAYLEY Forward-Curve Steam Driven Fan.

. . . IN 1954 — OUT FRONT AS ALWAYS
IN AIR HANDLING EQUIPMENT
Designed for Today's Faster Tempo . . .



Bayley 445 Aeroplex Fan With Flexible Coupling and 25 HP Electric Motor

BACK IN 1914, the Bayley-designed forward-curve fan was a pioneer conception in efficient air handling. Its riveted and bolted housing was the sturdiest that could be fabricated with the construction techniques of the time. The Bayley-built vertical steam engine offered the best type of power for the low-speed fan drive.

Today the Bayley *backward-curve* fan represents the highest in efficient wheel design adapted to modern air handling demands. The Bayley Type AP Fan, above illustrated, with its all-welded housing and pedestal, is correctly designed and proportioned for the higher speed drives now available.

When installing fan equipment, be sure you get *all* the advantages of truly modern air handling methods. Consult the Bayley Engineering Department.

Bayley BLOWER COMPANY
1825 S. 66th St. • Milwaukee 14, Wis.
Designer and Manufacturers for Over 60 Years

For more facts circle 618 on Reply Card

maintenance cost could thus be better controlled and more accurately allocated, with better and quicker service. However, with central control, properly administered, there is no reason why maintenance cost could not be properly allocated. There are many advantages to central control, from a strictly maintenance viewpoint.

Some of these are: Better utilization of the specialist since he can spread his talents over more units of equipment. Elimination of duplicate tools, tool cribs and attendants because central maintenance make more efficient use of tools, meters and costly testing devices. By pooling maintenance mechanics it is easier to take care of emergencies and to cope with absences. More uniform methods are employed since one head controls the entire works. Spare parts are minimized as are the overlapping functions. Departmental or unit maintenance could still function, on an assigned basis but reporting to central control for better coordination.

Keep only Necessary Records

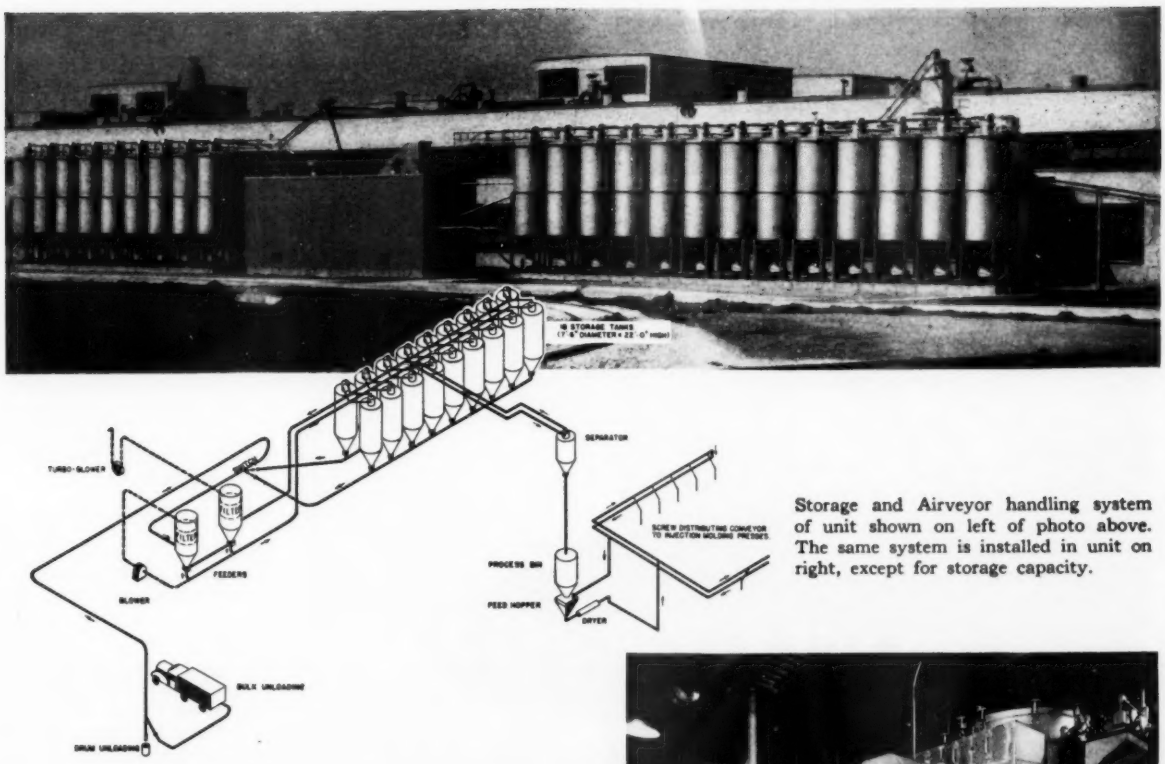
Records of all types are interesting, and are necessary in some cases, but all are not economically justifiable. Records are costly and care must be taken that the added cost of obtaining and maintaining them does not exceed the gain derived. The trouble with most records is that unless they are perfectly maintained they are unreliable.

There are many records that could be obtained for maintenance administration. These include: performance, parts, equipment, backlog, budget, inspection, cost and consumption, test records. Under each of these broad headings are many subdivisions.

The only records which should be maintained are those which will reduce cost, properly allocate charges and provide records which may help in studies for design or other purposes. There are some maintenance administrators who proudly state that they know exactly, to the last piece of equipment, what their maintenance costs are. However, the cost of obtaining such data becomes exorbitant.

Another problem of maintenance administration is the question of an incentive plan. Some of the arguments against incentive plans have been that due to the nature of maintenance it is not usually repetitive. Where it may be repetitive to some degree, the time element they say, varies too greatly for similar operations. Distances to the job varies. Height levels vary—some jobs are at floor level, others at ceiling level. Similar repairs may vary from a few minutes to hours.

The time study engineer would



Storage and Airveyor handling system of unit shown on left of photo above. The same system is installed in unit on right, except for storage capacity.

Granular plastics handling with speed and safety

by The AIRVEYOR®

Western Electric Company, after much study and investigation, selected the Airveyor for handling granular plastics at its Indianapolis plant, for many sound reasons, some of which are:

1. Adaptable to turns and long runs.
2. Ability to handle dusty materials with relatively clean pick up; also ease of cleaning out the system.
3. Non-existance of explosion hazards when handling plastic materials.
4. Dust-tight and weather-tight construction.

This all adds up to convenience in placing conveying ducts—vertically, horizontally, overhead, around corners—from unloading to storage, from storage to process. Seals dust in, contamination out. Prevents explosions, avoids respiratory hazards. Cleanliness all along the route, without spillage, to multiple points of storage and use.

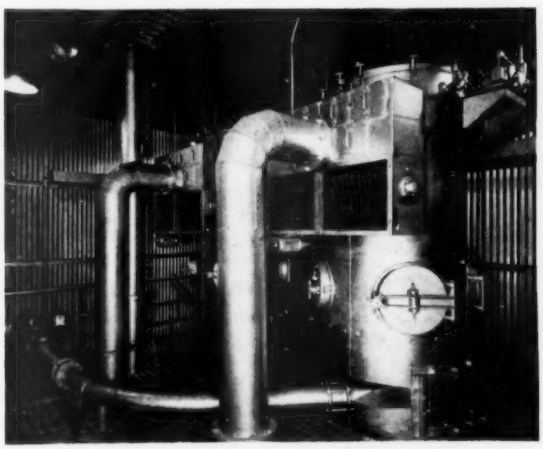
The Indianapolis plant handles up to 10,000 lb. of granular plastics an hour. The Airveyor system of ducts extends approximately 400 feet.

If you handle dry pulverized or granular materials, it will pay you to investigate the Airveyor, for better conveying, at less cost, and without contamination.

FULLER COMPANY, Catasauqua, Pa.

Branch Offices

Chicago • San Francisco • Los Angeles • Seattle • Birmingham



Four compartment, continuous Airveyor filters

Bulk unloading from truck, using the Airveyor

A-164—1960

Fuller **26 YEARS' EXPERIENCE IN PNEUMATIC CONVEYING**

For more facts circle 619 on Reply Card

To save time and money on material handling jobs, investigate the many advantages offered you by a Bucyrus-Erie 22-B crawler crane. Universally accepted as standard equipment for material handling on construction jobs, it can do the same A-1 job around your plants, warehouses and storage areas. Here's why:

High Maneuverability lets the 22-B work anywhere you want it, whenever you want it. It's quickly, easily moved from one job to another.

Independent Boom Hoist permits boom angle to be changed while machine is swinging or propelling, while load is being hoisted or lowered.

Accurate Reliable Boom Control with both raising and lowering full power-controlled by one lever makes it easy to maintain fast operation. A friction clutch on front drum shaft controls hoisting with speed governed by engine throttle. And, an automatic silent ratchet pawl prevents boom from lowering faster than front drum shaft is turning with consequent light service on brake.

Open-Throated Boom makes it easy to rig for 2, 3, or 4 parts of line without taking off sheave guards.

45E53

Quickly convertible to dragline, clamshell, shovel or dragshovel, the 22-B has many additional applications around your property that will mean added savings for you.

Write for complete information today.

BUCYRUS-ERIE COMPANY

SOUTH MILWAUKEE • WISCONSIN

For more facts circle 620 on Reply Card

quickly eradicate this argument on the basis of average time and law of average rules; the standard time could be set up on the basis of the shortest time and the longest time. Whether or not maintenance incentives are worthwhile is a frequently-asked question, the answers to which must depend upon the individual plant and its products.

Admittedly some plants could go on incentive very easily but there are more where it would present difficult administrative problems. Two of the difficulties of establishing standard time are the multitudinous maintenance repair operations and the infrequency of use of many of the standards. Some standards would have to be established, at considerable expense, with infrequent utilization afterwards.

Standards and Incentives

If standards can be accurately established and practically maintained for maintenance operations and the maintenance workers paid on either their own or group performance, then it certainly is worth considering. Where such plans are not practical then perhaps consideration should be given to a relationship between the performance of direct workers and the maintenance worker whose own contribution and effort made it possible for the direct worker to earn his bonus. It is impossible to state categorically that any maintenance function can be placed on an incentive plan, each plant has its unique problems and only after consideration of the economics and administrative problems involved can a decision be made.

As the inevitable degree of automatization and technological changes increase so does the importance of maintenance. Higher capital investments can not be justified unless the equipment can produce at maximum continuity and output of quality and quantity.

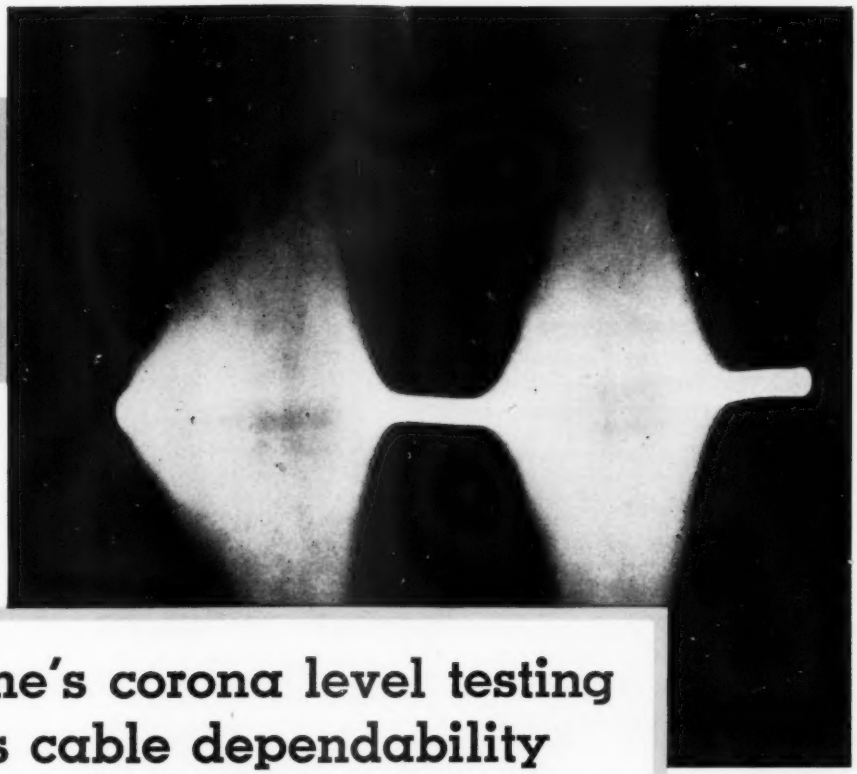
Simple maintenance is a thing of the past. The future will require that maintenance be placed on a higher status and engineering basis. No longer can management afford to permit old fashioned maintenance methods and organization of just "cut and try" procedures to be the succedaneum for modern methods of engineering and maintenance administration.

Analyzing Indirect Production Costs

(Continued from page 117)

re-issues of raw material because of shortages, spoilages, and for other reasons. On a monthly basis the Financial Division also provides a report of labor and material variances

Specially designed ionization detector for routine factory use measures corona level of all-insulated cables rated at 3000 volts or over.



Why Rome's corona level testing assures cable dependability

The picture above means trouble. It is an oscilloscope trace of internal ionization in an insulated cable.

Ionization is caused by the electrical break-down of air in pockets within the insulation, or between the insulation and conductor or shield. Should this ionization occur at a value below the operating voltage of the cable, several destructive electrical effects may occur such as possible ozone cutting, reduced dielectric strength, and a substantial increase in dielectric losses. Any of these hazards could result in early failure or reduce the efficient performance life of the cable.

Ionization is particularly dangerous because it cannot be detected by the ordinary visual, physical and electrical testing methods usually applied to cable.

So, to prevent guesswork, to assure you of maximum protection against ionization, *every foot of Rome insulated cable, rated at 3000 volts or over, is thoroughly tested by a specially designed ionization detector.* This instrument accurately measures the corona level of the entire cable. Unless the ionization voltage exceeds the intended operating voltage of the cable, the cable is rejected.

This is one more extra step in Rome Cable's standard manufacturing procedure that assures dependability. This completely new *NONDESTRUCTIVE* method of testing was developed by Rome Cable engineers and was first described in AIEE paper 48-198, "The Measurement and Investigation of Ionization Level of Rubber Insulated Cables," presented in August, 1948.

This X-ray reveals loose insulation—a major cause of ionization.

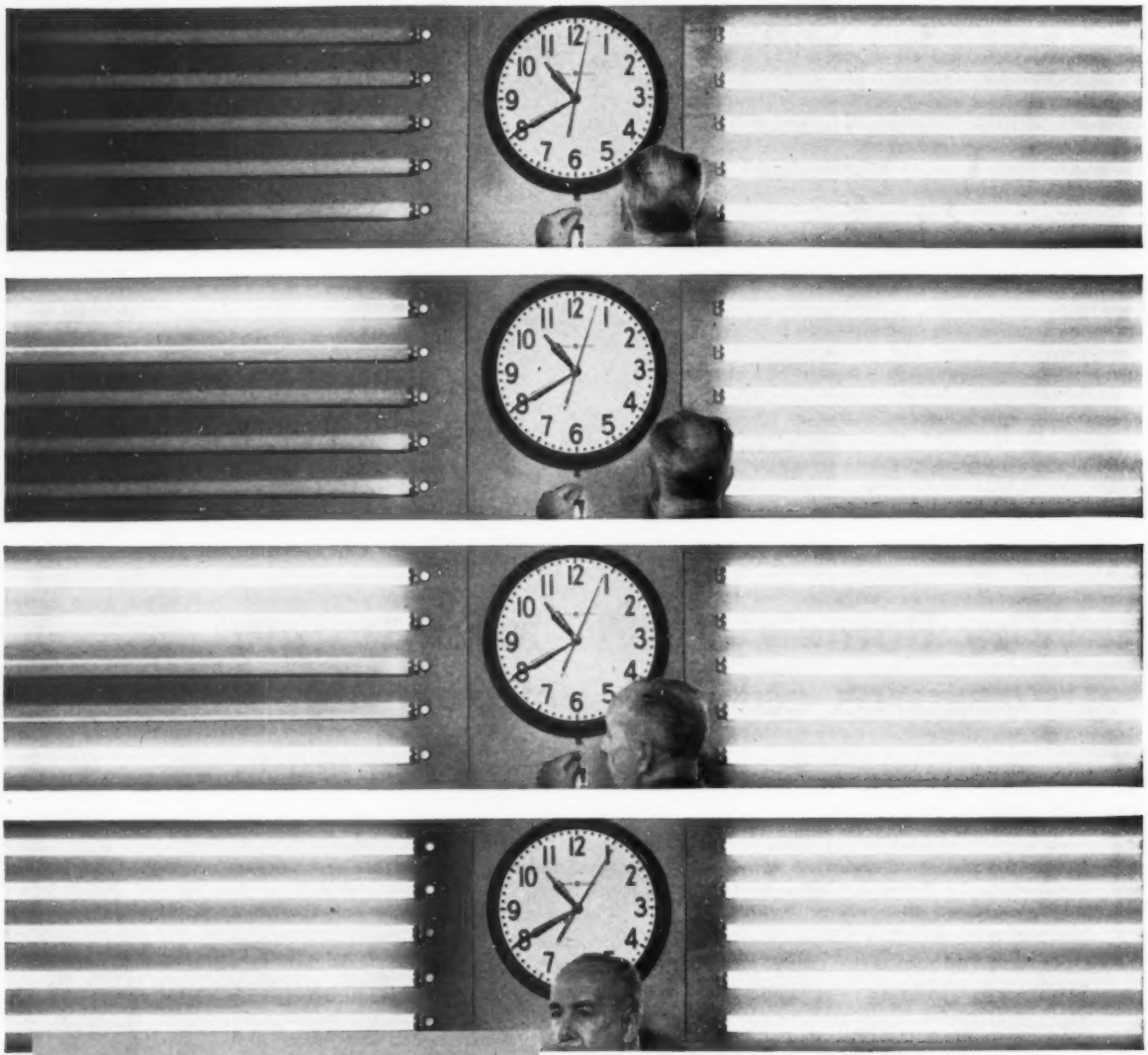
500,000 CM stranded single conductor RoZone insulated, shielded, RoPrene sheathed power cable . . . 15,000 volts, grounded neutral.

ROME CABLE Corporation
ROME · NEW YORK
and
TORRANCE · CALIFORNIA

ROME CABLE CORPORATION, Dept. PE-5, Rome, N. Y.
Please send me literature on ionization testing
..... Rome Power and Control Cable Catalog.
Name .....
Company .....
Address .....
City ..... Zone ..... State .....

For more facts circle 621 on Reply Card

YOU EXPECT THE BEST VALUE FROM G-E FLUORESCENT LAMPS



New G-E "Rapid Start" lamps light up twice as fast as others

This series of pictures shows how General Electric can save you the annoyance of waiting for light.

All the lamps were started as the second hand on the clock reached zero. Within two seconds, the G-E Rapid Start lamps—right of the clock—were fully lighted. It was nearly *six* seconds before all the regular lamps, left, lit up.

G-E Rapid Start lamps eliminate the starter, cause of up to half of regular lighting maintenance troubles. They have long life, too. Reason: a triple-coil cathode that holds more starting chemical.

General Electric Rapid Starts are another example of why you can *expect* the best value from G-E fluorescent lamps. For free folder, "Facts About Rapid Start", write: General Electric, Dept. 166-PE-5, Nela Park, Cleveland, O.

You can put your confidence in—

GENERAL ELECTRIC

For more facts circle 622 on Reply Card

against standard and on a quarterly basis provides a burden report.

In addition to all of the records indicated the Cost Control Supervisor maintains certain "home brew" records. Such records are relative to specific problems as they arise and are eliminated once the need no longer exists. In addition, the Cost Control Supervisor maintains routine budget analysis and downtime analysis, etc.

Interpretations of Findings

The considerable mass of information acquired through the various means indicated above is evaluated and recommendations made where possible. Such evaluation and recommendations vary from immediate on the spot recommendations to studied interpretations requiring weeks or months and ultimately resulting in written reports and recommendations.

As an example, the program for each year is projected in advance and is laid out to cover priority items which may take anywhere from a very short period to as much as a year. Also outlined in the projection are projects which will cover an extended period. The interpretation and evaluation of findings frequently requires the cooperation of such departments as our timekeeping, time study, engineering and top supervisory groups and the resulting action becomes a group action.

Interpretation of findings leads into many divisions of the company including our Financial Division, Inspection, Quality Control, Production Planning as well as others just indicated and often results in method changes, the establishment of new procedures, and standards in the attempt to achieve cost reductions.

Corrective Measures

As indicated above at least in part, corrective measures may take place immediately and on the spot or may require committee or group action on the part of many individuals and may of necessity result in product or method changes.

While many of the results of such a program have been, and will continue to be intangible, there have been definitely measurable results in terms of dollars and cents.

As an example, one Assembly Department which had been operating inefficiently with very high costs—both direct and indirect—for a considerable period of time was made a target for action.

Through an intensive, on-the-scene study, coupled with hour-by-hour, day-by-day cooperative effort of Cost Control, Timekeeping and Supervision a recommendation was made resulting

Here's where YOU should use Tannate* FLAT LEATHER BELTING

ON DRIVES WHERE YOU NEED MORE CAPACITY

Tannate with its high overload capacity is the economical way to get more production from your present equipment.

ON DRIVES SUBJECTED TO HEAVY SHOCK LOADS

— Tannate is resilient, absorbs heavy shock loads and acts as a cushion between motor and machine.

ON HIGH SPEED DRIVES

where belt speeds as high as 6,000 f.p m. are required. Tannate can do a good job because it is comparatively light in weight — consequently centrifugal force is less effective.

ON MULTIPLE PULLEY DRIVES

Tannate is flexible — can take the twisting and turning of serpentine drives, mule drives and quarter turn drives — has a high coefficient of friction (on both sides of the belt) that maintains high operating efficiency.

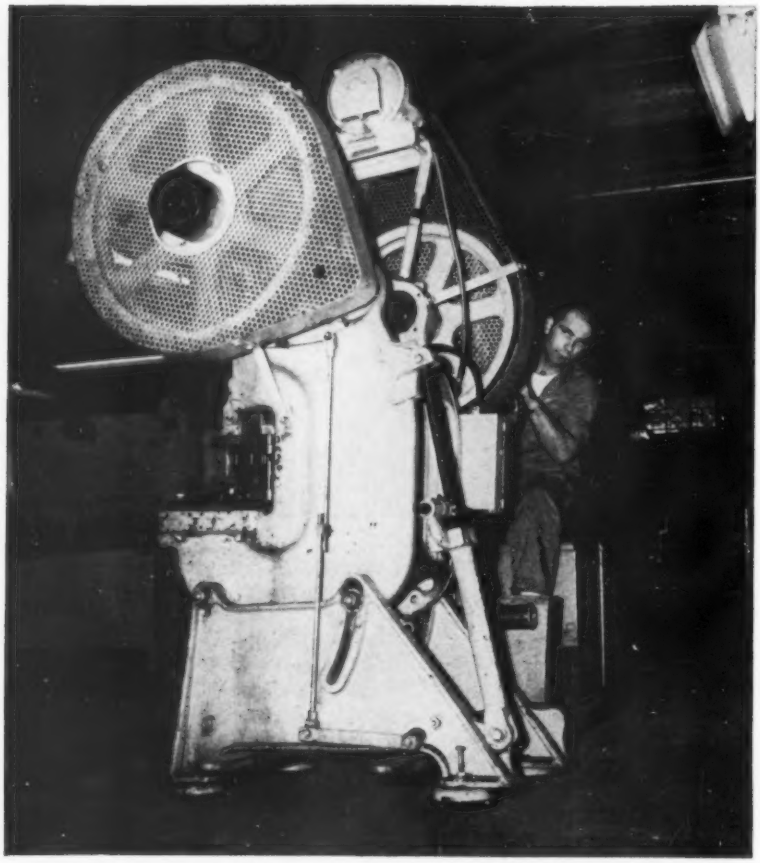
ON SHORT CENTER AS WELL AS LONG CENTER DRIVES

don't overlook the advantages of Tannate on short center drives. Although the Tannate short center drive usually does require a tension-controlling motor base for best performance, this means a constant, maintained RPM resulting in increased production capacity.

*What is Tannate?

Tannate is a *special tanned leather* belt. It combines exceptional grip, pliability, elasticity, strength, and durability. It will resist moisture, mineral oils and the fumes of most acids — will withstand high temperatures. For specifications, write J E. Rhoads and Sons, 35 North Sixth Street, Philadelphia 6, Pa.

RHOADS
INDUSTRIAL LEATHERS
PHILA. • NEW YORK • CHICAGO • ATLANTA
For more facts circle 623 on Reply Card



NEW "NO LAGGING" METHOD CUTS COSTS. This 45-ton Perkins press was moved 200 feet — and was back in production in only five minutes, because the press was equipped with Leveling Barrymounts.

DO YOU MOVE YOUR MACHINES OFTEN ENOUGH?
"Machines that move with the times" cut costs

OLD "BOLT AND SHIM" METHOD INCREASES COSTS. This 10-ton Press-Rite press was also moved 200 feet — but cutting bolt holes, setting lags, and driving shims took 33½ minutes. Can you afford it?

Smart management knows that rearranging machines to meet current production requirements makes sense. But many companies have not taken advantage of this opportunity to increase profits, because of the high cost of moving and installation. Today, with Leveling Barrymounts, your machine tools can be completely re-located in *man-minutes*. If you'd like to know more about how "machines that move with the times" can cut *your* costs, write today for your free copy of "Look — No Lagging!"

THE BARRY CORP.

1910 PLEASANT STREET
WATERTOWN 72, MASS.

SALES REPRESENTATIVES IN ALL PRINCIPAL CITIES

For more facts circle 624 on Reply Card

in Supervisory revisions, drastic reduction in (1) downtime, (2) trucking labor, (3) setup time. The results included also increased piece work hours or production hours, improved efficiency, and better morale of both supervisors and employees. The money savings on this project has been considerable.

Results of the first year in terms of dollars and cents reduction in cost have been sizable, and projects now in work and outlined for future action should definitely culminate in further cost reductions.

Tell-Tale Instrument Checks Poor Driving, Bad Floors

(Continued from page 98)

superintendent as a pattern to show correct usage. Company officials are able not only to locate accurately the causes for truck failure, but are also able now to police truck operators constantly according to the impartial judgment of the instruments themselves.

To show specifically how measuring devices may be used, we recently conducted tests in cooperation with the Elwell-Parker Electric Co., a leading manufacturer of powered industrial trucks, in its own plant, under simulated conditions. The object of these tests was to derive some basic data on tape, which would give us an indication of the magnitude and kind of impact which could be expected—based on known conditions.

Accordingly, this data would then serve as a standard against which data taken under actual operating conditions could be compared. Although by no means conclusive, here are some of the results as indicated on the recorder tape:

1. *Striking a wall:* Graph 11—A indicates a shock in excess of 9 g's—or approximately nine times the weight of the truck.

2. *Travel over rough floors:* Graphs 6 and 14 show the result of travel over rough pavement. No. 6 was with poor tires and at fast speed. No. 14 was with good tires and average speed.

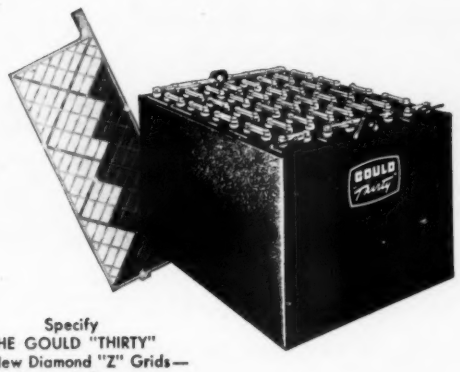
3. *Travel over a 2 x 4 placed in an aisle:* Graph No. 3 was the result of running truck over a 2- by 4-in. board.

It may thus be seen that the use of impact measuring devices can pay off in handsome savings in decreased truck maintenance and replacement costs and increased truck operating life. And of equal importance is the minimizing of possible injury to loads, operators and other employees with accompanying reductions in costly damage claims.

TIRELESS ACTION

THANKS TO BATTERY POWER!

Tireless action—that's what your industrial trucks have got to have to keep up with today's materials handling needs. That's what you get when they're powered with new Gould "Thirty" Batteries with Diamond "Z" Grids. Extra reserve, extra performance, extra stamina are built into these batteries to keep your trucks in action all day long. There's no power like battery power—no battery power like *Gould* power.



Specify
THE GOULD "THIRTY"
with New Diamond "Z" Grids—
America's Finest
Industrial Truck Battery

GOULD *INDUSTRIAL BATTERIES*

GOULD-NATIONAL BATTERIES, INC., TRENTON 7, N. J.

Always Use Gould-National Automobile and Truck Batteries

©1954 Gould-National Batteries, Inc.

For more facts circle 625 on Reply Card

NOW BETTER LIGHT
for extra-high bays
and outdoor areas
LOOK FOR THIS TRADEMARK
Radiant R-type Hi-Spot Lamps provide a narrow beam of uniform high intensity for extra-high bays and long distance lighting of outdoor areas. Cost less to install. No metal covers required. Outlast ordinary lamps. Special glass resists cracking due to sudden temperature changes, rain, and snow. Reduce maintenance. Silver reflecting surface is sealed inside. Stays bright without polishing. Available wattages are 300 and 500, medium or mogul base.
Send for Industrial Lamp Bulletin 83.
RADIANT
Reflector Weatherproof
HI-SPOT LAMPS
RADIANT LAMP CORPORATION
311 Jelliff Avenue Newark 8, N. J.
Manufacturers of Lamps from 50 to 10,000 watts for PROJECTION • SPOTLIGHT • FLOODLIGHT • INFRA-RED
AERONAUTICAL • MOTION PICTURE PRODUCTION • SPORTS LIGHTING and GENERAL SERVICE
For more facts circle 604 on Reply Card

The two Reader Service Cards on pages 35 and 219 are easy to use and need no postage. Just circle the item numbers of catalogs wanted, fill in name and company, etc., and drop the card in the mailbox. You'll receive the literature from the manufacturers at no cost to you.

Is It True What They Say About "Moly"?

(Continued from page 89)

these tests when completed may clarify, to some extent at least, the effectiveness of MoS_2 as a motor oil additive.

Reference has been made to one test on a Moly product . . . known as the "fixed throttle" test. NBBB has been informed by a number of outside authoritative sources that the fixed throttle type of test is not considered significant by engineers nor is it accepted as a standard test procedure.

Conclusions

While there appears to be no doubt that molybdenum disulphide serves as an effective lubricant under many conditions of use, the National Better Business Bureau has been unable to secure, either from outside authorities or from the Moly advertisers themselves, convincing evidence, in the form of competent laboratory or field test data from an independent, scientific agency of recognized standing, that moybdenum disulphide promotes greater oil efficiency or entails greater gasoline mileage when used as a motor oil additive.

Recommendations

It is the belief of the National Better Business Bureau that any advertiser, before making claims to the public, should be both prepared and willing to submit competent proof of such claims to any source having a legitimate interest. It is therefore the recommendation of this Bureau, that, in the public interest, advertising claims of Moly, or any other motor oil additives be confined to those which are substantiated by either laboratory or field tests made by independent scientific testing agencies of recognized standing.

Vibration in Electrical Machines

(Continued from page 121)

moving element that receives vibrations from a pick-up prong. The stylus embosses the vibration curve on film. Besides the record of vibrations, a timing curve of 30 cps fequency is embossed on film during recordings and provides a means of evaluating the frequency of the recorded vibrations.

For recording torsional vibrations, an instrument called the Geiger Torsiograph maybe used. It consists of a lightweight frame keyed to the shaft, and of a heavy flywheel inside of the frame that is coupled to the shaft by a soft spring. When the shaft rotates uniformly, both members of the Torsiograph follow it. If torsional vibrations appear, the frame will follow the movement of the shaft, but the flywheel will continue to rotate at uniform speed. Relative movement between the frame and flywheel is recorded on paper moved under a key.

Points to look for when you select a Packaged Boiler:

1 Fiberglas insulation with metal jacket and metallic paint finish.

2 Lift lugs for convenient handling on job site.

3 Boiler shell made of flange quality steel. All joints electrically welded. High pressure shells X-rayed to insure flawless construction and long life.

4 Separator to assure dry steam supply (99%+).

5 Practical front-end construction provides open flow of combustion gases to stack. No refractories to maintain. Entire burner front hinged, providing easy access to fire tubes.

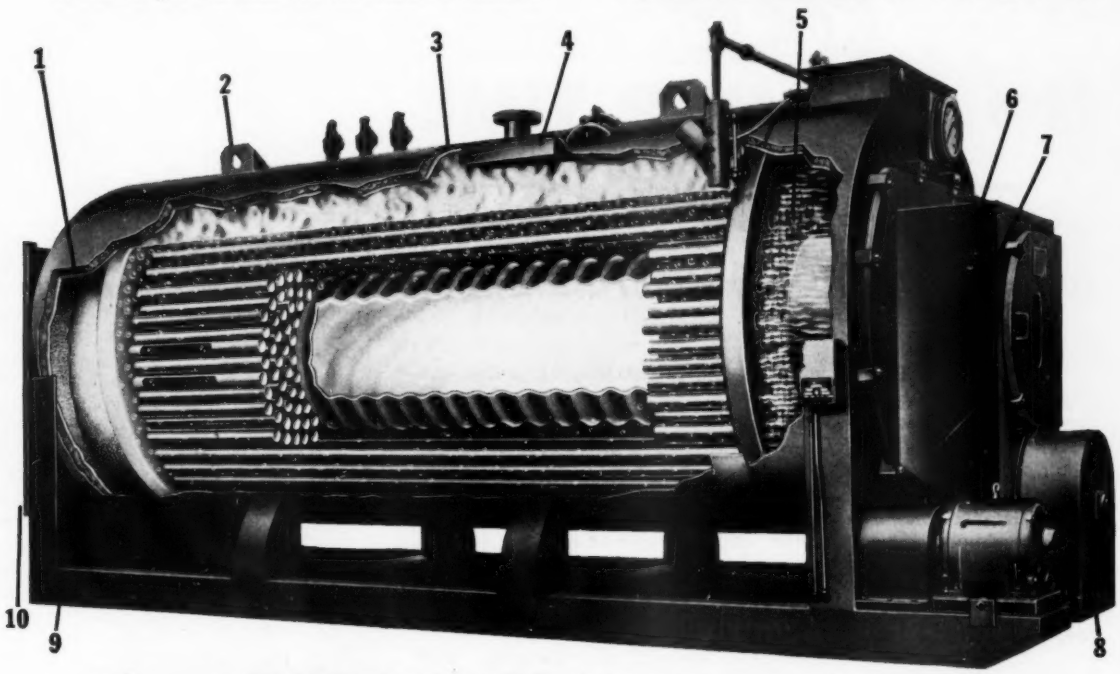
6 Burner and its vital parts—such as fuel nozzles, flame scanner and ignition assembly—fully enclosed in steel housing for safe operation.

7 Dual air-flow burner—for oil or gas fuels—precisely fitted to the boiler furnace. Burner specially designed to mix fuel and air for high combustion efficiency. Heat transferred directly to water surrounding the furnace.

8 Air for the burner passes through an inlet silencer to a forced draft fan. Air flow controlled by adjustable dampers.

9 Structural steel base distributes weight evenly on boiler room floor. No special foundation required.

10 Hinged rear door lined with insulating refractory. Door can be opened in a few minutes—affording access to furnace and all return tubes. No need to remove and replace refractory baffles or brick work. Note sturdy hinge construction which insures positive seating of door.



The CONTINENTAL Automatic Boiler

- **Two-pass design—simple and practical. Range 20 to 500 hp.**
- **Factory-tested before shipment. Guaranteed 80% efficiency.**
- **Maximum radiant heat transfer from flame to water-cooled furnace walls.**
- **Even heat transfer—uniform flow of hot combustion gases through all return tubes.**
- **Free and rapid water circulation keeps all heating surfaces clean and improves transfer of heat to boiler water.**
- **High CO_2 and low stack temperature—guaranteed not to exceed 125°F. above saturated steam temperature at operating pressure.**

CONTINENTAL BOILER DIVISION

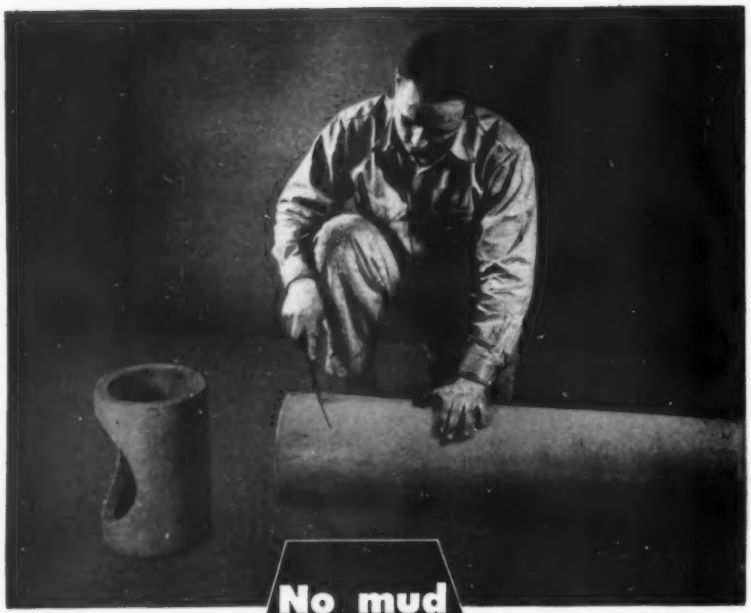
BOILER ENGINEERING & SUPPLY COMPANY, INC.

1000 Manavon Street • Phoenixville, Pa.

40 YEARS OF BOILER MANUFACTURING EXPERIENCE

CONTINENTAL is sold, installed and serviced by competent distributors throughout the U.S.

For more facts circle 627 on Reply Card



No mud
No dust

NO CLEANUP TIME

*with G-B Snap*On Pipe Insulation!*

Insulating pipes is no longer a messy job that ruins the appearance of the plant — not when you use G-B Snap-On pipe insulation! This new one-piece pipe insulation of molded fine glass fibers is absolutely dustfree —won't crumble or flake when dry, won't get gummy or muddy when wet. For these reasons, it can be applied during regular working hours.

Because it is so clean to handle, this new pipe insulation involves almost NO CLEANUP TIME — one of the big reasons why users report application savings up to 50%. This unusual cleanliness feature also makes it very popular in food, chemical and other plants that cannot afford to run the risk of product contamination.

Other properties are equally unusual and pleasing. G-B Snap-On pipe insulation is exceptional in thermal efficiency . . . 4 to 10 times lighter than any other . . . easy to finish . . . easy to cut with a knife . . . fire-resistant . . . rotproof . . . won't absorb moisture. But don't take our word for it — write today for samples and make your own tests. You'll find that in every respect G-B Snap-On pipe insulation is the first all new pipe insulation in 60 years!

*Trademark Reg.

gb GUSTIN-BACON MFG. CO.

244 W. 10th St., Kansas City, Mo.

New York • Chicago • Philadelphia • San Francisco • Los Angeles
Houston • Tulsa • Dallas • Detroit • St. Louis

For more facts circle 628 on Reply Card

NEW BOOKS

for the plant engineer

Resources for the Future

ENERGY IN THE FUTURE. By Palmer Cosslett Putnam. 1st edition, 556 pages, 6½ by 9¼ in.; cloth binding. Published by D. Van Nostrand Company, Inc., 250 Fourth Ave., New York, N. Y. 1953. Price $12.75.

THIS BOOK PRESENTS a study of the problem "Where Can We Find Sources of Low-Cost Energy in an Abundance Equal to the Maximum Plausible Demands by the Expanding and Industrializing Populations of the Future?"

In 1949, the Atomic Energy Commission asked Palmer Putnam to make a study of the maximum plausible world demands for energy over the next 50 to 100 years. This book embodies the results of that study. The author's systematic analysis of the problem includes a review of past population growth in a search for answers to the question, "Is population growth predictable?" Having concluded that it is not, he creates the device of a hypothetical trustee of energy who then asks, "What are the maximum plausible populations of the next 50 to 100 years and what are the maximum plausible demands for low-cost energy?" The maximum plausible world population in the year 2050, says Putnam, will be 6 to 8 billions. Coal, oil, and gas, the low-cost fossil fuels, will have been depleted. It is essential therefore, to accelerate the development of atomic power, explore nuclear reactions other than the fission of uranium and thorium and explore all ways to obtain income energy from sunlight in more useful forms and at lower cost than now appear possible.

The author is a consulting engineer, a graduate of MIT; he carried out post-graduate research in Germany and at Yale.

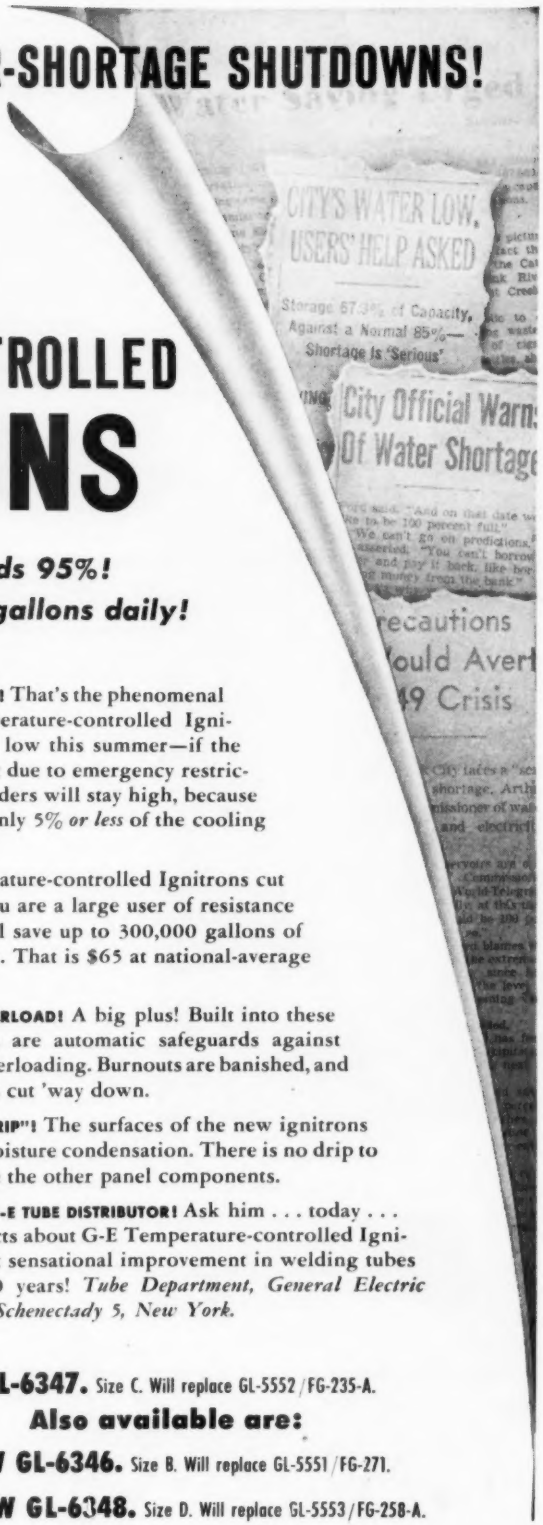
Industrial Timers

TIMING ENGINEERING by Myrten G. Saake. Size 9 by 6 in; 243 pp; illustrated; index; cloth bound. Published 1953 by Ribble Engineering Co., 74-80 Montgomery St., Jersey City 2, N. J. Price $5.00.

DURING AN EPISODE of human history such as we are now passing through, when so often it is said, "Time is money," this book is most appropriate.

Since so much thought and effort is going into finding methods of automation, here is a compilation of ideas and methods on time engineering

Welder users: AVOID WATER-SHORTAGE SHUTDOWNS!


CITY'S WATER LOW, USERS' HELP ASKED
Storage 67.3% of Capacity, Against a Normal 85%—Shortage Is 'Serious'
City Official Warns Of Water Shortage
recautions
ould Avert
49 Crisis

TEMPERATURE-CONTROLLED IGNITRONS

***Cut* cooling-water needs 95%!**
***Save* up to 300,000 gallons daily!**

ONE GALLON DOES THE WORK OF 20! That's the phenomenal water saving with G-E Temperature-controlled Ignitrons! In case your wells run low this summer—if the municipal water supply is cut due to emergency restrictions—output from your welders will stay high, because these new ignitrons need only 5% *or less* of the cooling water formerly required.

ECONOMICAL! G-E Temperature-controlled Ignitrons cut operating expense! If you are a large user of resistance welders, your plant will save up to 300,000 gallons of water in an 8-hour day. That is $65 at national-average water cost.

WON'T OVERHEAT, OVERLOAD! A big plus! Built into these new G-E ignitrons are automatic safeguards against overheating and overloading. Burnouts are banished, and tube replacements cut 'way down.

NO DAMAGING "DRIP"! The surfaces of the new ignitrons are free from moisture condensation. There is no drip to rust or damage the other panel components.

PHONE YOUR G-E TUBE DISTRIBUTOR! Ask him . . . today . . . for all the facts about G-E Temperature-controlled Ignitrons—most sensational improvement in welding tubes in over 20 years! *Tube Department, General Electric Company, Schenectady 5, New York.*

NEW GL-6347. Size C. Will replace GL-5552/FG-235-A.

Also available are:

NEW GL-6346. Size B. Will replace GL-5551/FG-271.

NEW GL-6348. Size D. Will replace GL-5553/FG-258-A.

GENERAL ELECTRIC

161-183

For more facts circle 629 on Reply Card

that should prove most interesting.

Equipment operating automatically has inherent time characteristics, and several examples of both sequential timing for a continuous operating cycle or an intermittent or emergency timing are detailed. The obvious purposes of overcoming time lag between operations and of eliminating random responses are reviewed.

One timing device worth noting is the combination of automatic timing coupled with automatic counting, a field that still holds the possibility of many fruitful applications.

While this book has been prepared by a manufacturer of timing equipment, the applications may well go beyond the examples given, and thus may serve as a useful reference.

For any one with problems relating to timing this is a good book to use either as a starting point or to find a solution.—HBW

On Drafting

ENGINEERING DRAWING by Frank Zozzora. Size 11 by 8½ in.; 369 pp including index; illustrated; cloth bound. Published by McGraw-Hill Book Co., Inc., 330 West 42nd St., New York 36, N. Y. Price $5.00.

HERE IS a good treatment of the subject of engineering drawing for students and for use as a reference by others. The material is well arranged and is coupled with many fine and clear illustrations.

Information is presented in a sequence that is considered to be of the most benefit to the study of the subject. A special section in the book is devoted to a concise familiarization with shop operations. This gives the student a better appreciation of the part that drawings play in industrial operations.

Several sources of information were consulted in the preparation of the material for conformance to accepted practice. These included manuals of such firms as General Motors, Allis-Chalmers, and Curtis-Wright.

Architectural and aircraft drawing, jig and fixture work, charts and graphs are not included. However, a bibliography of reference material on these subjects is offered.

Vaporsealing Insulation

VAPOR AND WEATHER BARRIERS for Low Temperature Thermal Insulation. Size 11 by 8¼ in.; 80 pp; illustrated; tables. Published by Insul-Mastic Corporation of America, 1141 Oliver Bldg., Pittsburgh 22, Pa.

THIS VOLUME COVERS the field of thermal insulation of equipment, operating at low temperatures, in a precise, graphic fashion. The text is amply aided not only by pictures but by reproduction of blueprints and cutaway drawings. The structural details that should be given full attention are carefully delineated and the disruptive effects of moisture are fully illustrated.

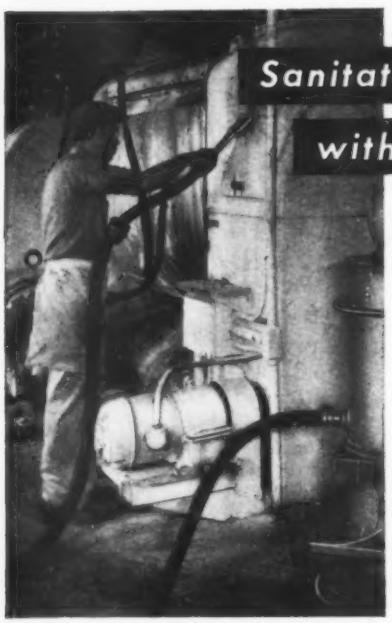
The scope of treatment and handling of insulation is applicable to other, similar materials. Since the merchandising aspects of the subject have been made subservient to methods of treating various structures, equipment and insulation problems, the book should be a useful one to refrigeration engineers, production directors of plant processes operating at reduced temperatures and to maintenance personnel.—HBW

Materials Processing

MATERIALS AND PROCESSES by James F. Young. Size 9 by 5¾ in.; illustrated; index; cloth bound. Second edition, 1954. Published by John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, New York. Price $8.50.

THIS IS THE SECOND EDITION of a work intended as a comprehensive coverage of engineering practices relating to methods and procedures for processing a variety of materials. It is an ambitious undertaking, but, happily, is quite successful.

Written in straightforward and unambiguous language, the book gives a strictly practical approach to the problems it discusses. There are at the end of the chapters both problems for the student, and a list of collateral readings for those interested in the amplification of some specific point or subject.

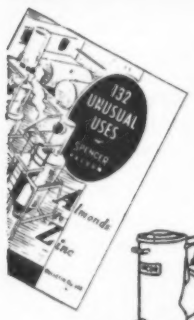


Sanitation costs less with SPENCER vacuum

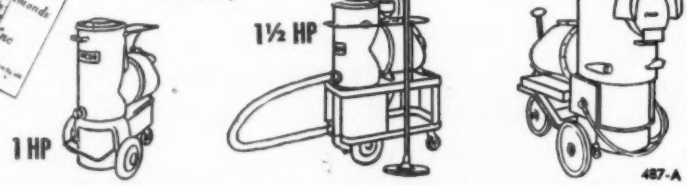
Take the job of handling hot materials, removing fly ash, picking up spilled liquids or handling fine chemical powders. Consider the time saved, the comfort and safety involved when these tasks are done with Spencer Vacuum.

Then consider that these Spencer machines will clean your plant and your machines at night—faster and at lower cost. That you can reclaim foods, chemicals, and metals, can speed up the assembly and inspection lines—in fact you can be sure that not only your plant, but your finished products are always clean.

Spencer representatives have special information on more than 100 special applications that can improve your plant sanitation and increase production.



Send for Bulletin No. 144 describing 132 unusual uses for Spencer Vacuum in industry.



487-A

THE SPENCER TURBINE COMPANY • HARTFORD 6, CONNECTICUT

SPENCER HARTFORD

For more facts circle 630 on Reply Card

NOW forecast your electron tube inventory movement with greater accuracy

Inventory Control Cards and Visible Record Binder show records of the day-to-day status of each tube type.

IT TAKES FORESIGHT and good planning on the part of plant purchasing men to avoid unbalanced equipment maintenance inventories. This is especially true in the case of users of electronic equipment where components such as electron tubes are vital to the continued operation of production equipment.

Your RCA Tube Distributor can help you to forecast your electron tube requirements with greater accuracy by applying the *RCA Tube Inventory Maintenance Plan* to your specific operation. This plan will help you to reduce over-stocks yet maintain a streamlined inventory of tubes at all times.

Not only will you be able to set up accurate reserve stocks under the *RCA Tube Inventory Maintenance Plan,* but your RCA Tube Distributor will be in a better position to back up your requirements with his convenient local supplies, and to service your tube needs with greater efficiency.

There's nothing for you to sign . . . nothing to buy, to get the plan started. Why not phone your RCA Tube Distributor today. Set up a date to put the *RCA Tube Inventory Maintenance Plan* into operation.

RADIO CORPORATION of AMERICA
ELECTRON TUBES **HARRISON, N.J.**

For more facts circle 631 on Reply Card

This should prove a useful volume either as a textbook or a reference in the plant, where it might be a source of ideas for new methods.—HBW

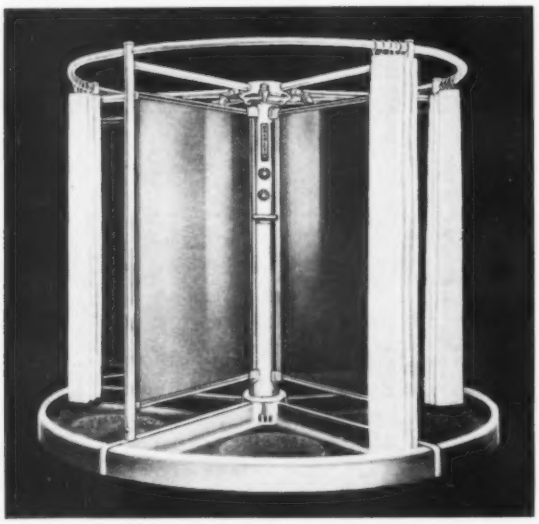
American Scientist

ELIAS E. RIES, INVENTOR. By Estelle H. Ries. First edition; 369 pages; 5¾ by 8¾ in.; cloth binding. Published by the Philosophical Library, 15 E. 40th St., New York 16, N. Y. Price $4.75.

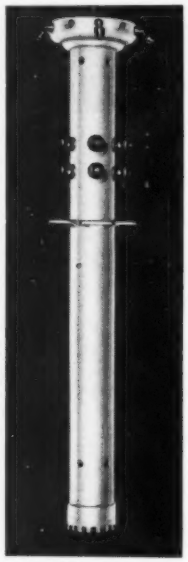
ELIAS E. RIES, ONE OF the great inventors and scientists of America, is portrayed in this book in a full-length biography by his daughter. Ries was first to invent practical methods and apparatus for welding and riveting by electricity and to make possible the photographing of sound on film on which today's great talking-picture industry is based, proofs of which are fully and dramatically disclosed in this book.

Amazing stories behind the scenes of these great inventions are revealed in this book. Here, you will discover some of the tragedies of genius when it comes into conflict with big business, absurd patent regulations, impossible economic situations and certain human pettiness.

Ries was one of the lone inventors. No large foundation helped him, no subordinates contributed any ideas. This book discloses a career rich in interest, a human document of high significance, a narrative of tremendous achievement, a moving story of unusual scope and inspiration.



Complete 5-Stall Shower with receptors at bottom. Also made in wall-type 3-stall units.



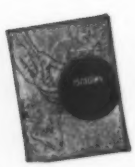
Column Showers (no partitions) provide lowest cost shower facilities. They serve five bathers simultaneously.

MORE PLANTS INSTALL BRADLEY MULTI-STALL SHOWERS

The sanitary features of Bradley Five-in-a-Group Showers and the savings in installation, piping and connections are realized by more and more plants. *One set* of cold and hot water, and one drain *replaces 5 sets* needed for 5 single-stall showers. Some recent Bradley installations include 4 Units at Ladish Co., Cudahy, Wis.; 3 at Evinrude Motors, Milwaukee, Wis.; 6 at International Paper Co.; 11 at North Seadrift, Texas chemical plant of Carbide & Carbon Co.; 6 at Marrero, La., plant of Celotex Corporation; 4 at Ford Motor Co., Canton, Ohio plant; 10 at Colombia, South America, National Steel Co. plant; 8 at Vancouver, Wash., plant of Aluminum Co. of America.

For helpful washroom Shower and Washfountain layout suggestions, write for Catalog 5204.

BRADLEY WASHFOUNTAIN CO.
2273 W. Michigan Street, Milwaukee 1, Wisconsin



For complete data on Multi-Stall Showers and Washfountains, write for Catalog 5204

BRADLEY multi-stall showers

Distributed Through Plumbing Wholesalers

For more facts circle 632 on Reply Card

Electronic Circuits

ELECTRONIC CIRCUITRY FOR INSTRUMENTS AND EQUIPMENT. By Milton H. Aronson. First edition; 310 pages, 5½ by 8 in.; cloth binding. Published by Instruments Publishing Company, 921 Ridge Ave., Pittsburgh 12, Pa. 1953. Price $4.00.

IN NON-MATHEMATICAL style suitable for technicians and engineers, the author first presents electrical fundamentals — resistance, capacitance, inductance, impedance, resonance and signal shaping. Next vacuum tube and gas tube fundamentals are presented, followed by amplification, rectification and oscillation circuits including electrometer tubes, cathode followers, clippers, limiters, clampers, peakers, modulators, demodulators, etc. Each unit is covered thoroughly.

Noteworthy is the chapter on solid state amplifiers which presents the operation of magnetic dialectric and transistor amplifiers. The book contains more than 450 multiple choice home-study-type question items so that it may be considered as a text and home study course for anybody who wishes either to learn electronic circuitry for instruments, communication, TV, or military electronics, or to keep abreast of the many new developments.

Elementary Mechanics

SIMPLIFIED MECHANICS AND STRENGTH OF MATERIALS by Harry Parker. 1st edition; 274 pages, 5¼ by 8 in.; cloth. Published by John Wiley & Sons, Inc., 440 Fourth Ave., New York.

THIS IS AN ELEMENTARY treatment written for those who have had limited preparation. A working knowledge of algebra and arithmetic is sufficient to enable the reader to comprehend the mathematics involved in the book.

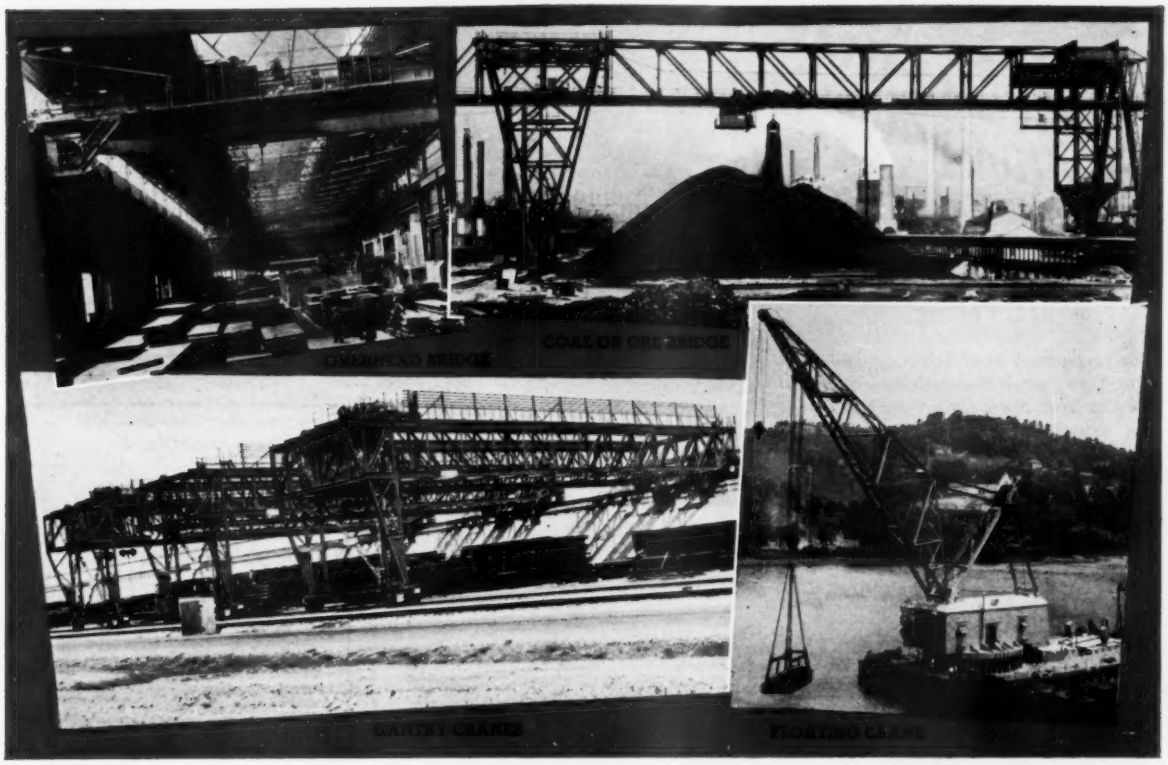
The volume was written for use as a textbook in courses in mechanics and strength of materials and for use by practical men interested in mechanics and construction. Because it is elementary, the material has been arranged so that it may be used for home study.

For those who have had previous training it will serve as a refresher course in reviewing the most important principles of structural design.

One of the most important features of this book is a detailed explanation of numerous illustrative examples.

The designer of structural members must have at hand tables of allowable stresses, properties of sections and other tables giving engineering data. Such tables are included in this book.

CLARK CRANE CONTROLS



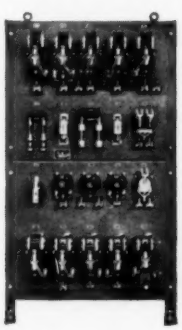
• BETTER PERFORMANCE • LESS MAINTENANCE • GREATER SAFETY — *for any type of crane*

Of the many outstanding performance, maintenance and safety features built into CLARK Crane Controls, three are especially important:

1. The VARI-TIME PRINCIPLE. Smooth, rapid "definite-time" acceleration is achieved by the famous CLARK VARI-TIME core, guaranteed trouble-free for the life of the equipment. This is built as an integral part of the "RT" contactor for the ultimate in simplicity, or furnished with the "VT" relay—a relay built like a contactor. It greatly simplifies the circuits.
2. The CLARK Plugging Relay used on the Bridge and Trolley Control is completely foolproof, and cannot get out of adjustment. It prevents equipment abuse and eliminates needless use of the foot brake.
3. The CLARK Hoist Control features a circuit designed and interlocked to prevent opening of the armature-series-field circuit for protection during lowering.

Many additional features contribute to fast, dependable performance and consistent, trouble-free service.

Typical CLARK Crane Hoist Control Panel.



If you have a crane control problem, consult your nearest CLARK representative or write us direct.

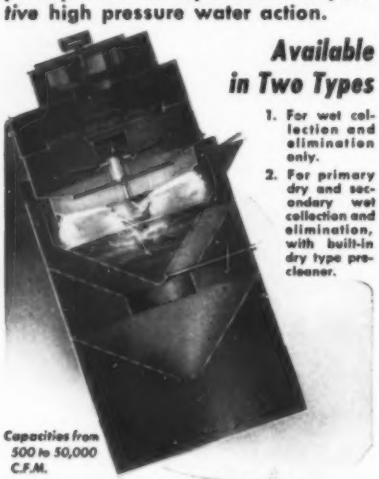
THE CLARK CONTROLLER CO.

ENGINEERED ELECTRICAL CONTROL • 1146 EAST 152ND STREET, CLEVELAND 10, OHIO

For more facts circle 633 on Reply Card

Now THE NEW
Schmieg CENTRI-MERGE
Vertical Rotor Type DUST and FUME Eliminators
FOR THE MOST Economical COLLECTION and ELIMINATION Efficiency

An important new Schmieg development to wash hazardous dust and fumes from the air in a rotating torrent of water, combining the cyclonic principle of dust separation and positive high pressure water action.



Capacities from 500 to 50,000 C.F.M.

Available in Two Types

1. For wet collection and elimination only.
2. For primary dry and secondary wet collection and elimination, with built-in dry type precleaner.

Just a few of many reasons why a new Centri-Merge unit is your best investment in operating efficiency and economy:

• Low ratio of power to rated capacity • High ratio of water circulated to air volume handled • Independently driven low speed rotor and fan permit adjustments to load and operating conditions • No slots or nozzles to restrict water action • Automatic liquid level control • Optional location of air inlet arm • Material disposal by drag conveyor, hopper tank skim-off or manual clean-out • Easy access to clean-out doors for cleaning while unit is in operation • Bearings located out of liquid, fully enclosed, lubricated from outside.

Write or phone for Bulletin VU 8-53, describing the new Vertical Rotor Units. Then consult with Schmieg engineers to plan a Centri-Merge installation for maximum dust and fume collection and elimination efficiency in your plant.

THE final AIR PURGE in CENTRI-MERGE

Schmieg INDUSTRIES INC.
Engineers & Manufacturers
P O BOX 4701 • DETROIT 34, MICHIGAN

For more facts circle 634 on Reply Card

Subsurface Investigation

(Continued from page 114)

than 10 to 15 ft below the bottom of the proposed footings. Unless soft material is encountered above the boring depth, the effect of soft strata underlying at depth is usually of little consequence, unless the area of the structure is covered by a fill of considerable depth.

The bearing capacity used in the design of spread footings when tough, very tough, or hard clays, silts or sands are encountered, can be determined with reasonable accuracy by use of the bearing capacity relationships established by Dr. Karl Terzaghi.

In the event that soft or stiff clays, organic matter, or loose silts are encountered, tests should be performed to determine the compressibility of the material. The column loads should be supported on piles or caissons to a deeper strata of greater strength if probable settlements are critical.

If the area of the plant is covered by top soil of some thickness, and floor loads exceed several hundred pounds per square foot, it is advisable to remove the top soil and replace it with granular fill or a compacted clay fill, since top soil will compress considerably under relatively light loads.

Construction problems involved in a plant structure are generally not extremely serious because excavations are not deep. Footings are usually carried below the frost line and no deeper. Whenever footings must go below the water table, the effect of the water in causing quicksand and softening clay in the excavation must be considered.

Heavy Press Foundation Problems

Industry's trend toward the use of larger and larger forging equipment, compressors, and generators poses a special problem. These giant machines cause impact and vibratory loadings over and above their own weight. In non-cohesive materials these dynamic loadings can cause serious settlements.

Soil mechanics has evolved a solution to the problem through the use of chemical stabilization. Where the machinery location overlies loose sand serious settlements might be encountered. It is now possible to impregnate that sand with chemicals to cause solidification and secure ample cohesion to prevent settlements due to vibration.

This is one specific example of the progress being made in soil mechanics to analyze and solve the problems which arise in industrial construction. The integration of this relatively young science with modern day construction planning and techniques will bring an end to the structure failures.

LIKE AN ATOMIC EXPLOSION
JUST ⅛" FAUCET LEAK MUSHROOMS INTO ATOMIC WASTE OF APPROXIMATELY
95,000
GALLONS OF WATER YEARLY!

Cost of wasted water @ $1.90 per M. cu. feet is $24.14.* If the leak is in a hot water faucet then fuel cost for heating this wasted water will be: $88.91 if coal (9,879 lbs.)†; $91.08 if oil (792 gals.)†. $84.41 if gas (84,411 cu. ft.)†. *These figures authenticated by Hackensack Water Co.* and American Gas Association†.*

you can stop this needless waste now with Pat'd
'SEXAUER' "EASY-TITE" Faucet Washers

THE ONLY WASHERS BUILT LIKE A TIRE WITH FIBERGLAS RE-ENFORCEMENT.

Fiberglas, with a melting point of 1200°F., is unaffected by destructive heat of modern superheat water systems; has a tensile strength of 460 lbs. per sq. in.; non-absorbent; resists all chemicals.

'SEXAUER' "EASY-TITES" OUTWEAR ORDINARY WASHERS 6 to 1!

...Now available with a greatly improved special du Pont COMPOUND which adds substantially to longer, trouble-free washer service. This COMPOUND keeps washer from going to pieces under extreme hot water, withstands water impurities and has superior tensile strength. That's why 'Sexauer' "Easy-Tites" won't spread, split or "mush-out." Also why 'Sexauer' "Easy-Tites" outlast all other washers by 6 to 1, thus saving labor on 5 REPEAT REPAIRS, plus water and fuel while prolonging life of expensive fixtures.

FREE CATALOG!

For water savings, lower maintenance costs, lower fuel costs, write today for new Edition H. 'Sexauer' "Easy-Tite" washers just one item in over 3,000 TRIPLE WEAR plumbing repair parts and precision tools. It's today's accepted buying guide for discriminating purchasing and maintenance personnel among thousands of top PLANTS, INSTITUTIONS and GOVERNMENT AGENCIES that rely on 'Sexauer' repair materials.

'SEXAUER' MAINTENANCE ENGINEER AT YOUR SERVICE

There's a 'SEXAUER' TECHNICIAN within quick call from coast-to-coast, who offers a special SURVEY SERVICE that sets up schedule of exact replacement parts for your plumbing fixtures regardless of make or age. *No obligation!*

A postcard will bring him and your NEW catalog promptly

J. A. SEXAUER MFG. CO., INC. Dept. S-54
2503-05 Third Avenue, New York 51

as advertised in THE SATURDAY EVENING POST

SEXAUER
WORLD'S LEADING SPECIALISTS IN PLUMBING AND HEATING REPAIR PARTS

For more facts circle 626 on Reply Card

wrapping a pipe . . .

or loading a barge

FLEXON REX-TUBE

. . . gives you Flexibility + Rugged Durability . . .

The two jobs illustrated above just begin to illustrate the wide range of applications for Flexon REX-TUBE . . . the hose of 1001 uses. For handling non-searching liquids, gases and powdered or granular solids at low to moderate pressures, REX-TUBE gives you the flexibility you need for easy handling . . . the rugged durability and modest cost you need for overall economy. Often REX-TUBE pays for itself many times over by eliminating the need for complicated piping or conveying systems. Where manual handling is required, REX-TUBE offers all the convenience of ordinary hose.

Look around and the chances are you can spot a job that REX-TUBE can do better. Your Flexonics distributor will be glad to give you further information on REX-TUBE, and on Flexon high pressure hose as well. Look for his name in the classified pages of your telephone directory or we will send it to you.

Catalog 130-R gives specifications on REX-TUBE and the many other types of Flexon hose. Write for your copy or see the Flexonics' catalogs in Refinery Catalog, Sweet's or Chemical Engineering Catalog.

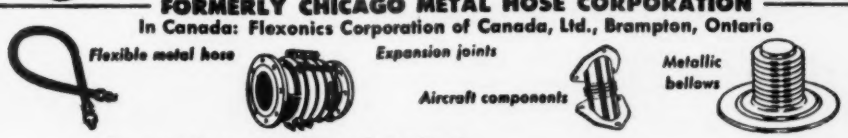
Flexonics Corporation, 1340 S. THIRD AVENUE · MAYWOOD, ILLINOIS

CHICAGO METAL HOSE DIVISION

FORMERLY CHICAGO METAL HOSE CORPORATION

In Canada: Flexonics Corporation of Canada, Ltd., Brampton, Ontario

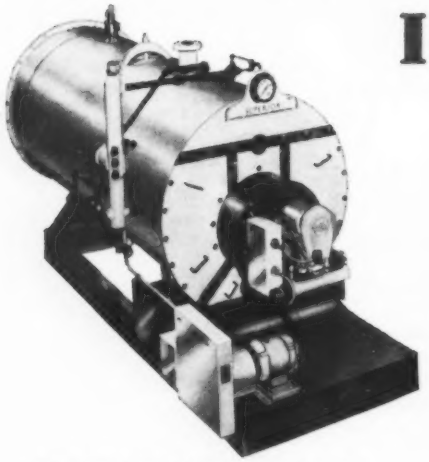
Flexon identifies products of Flexonics Corporation that have served industry for over 52 years.



For more facts circle 635 on Reply Card

Completely "Packaged" Superior Steam Generators on factory test line.

only a TRUE PACKAGED boiler IS TESTED like this.



18 sizes from 20 to 600 b.h.p. for pressures to 250 p.s.i. or for hot water. For complete details write for Catalog 605.

At the Superior factory in Emmaus, Pa., every steam generator is thoroughly tested before shipment. This is one of the outstanding advantages of the *true* packaged steam generator. Completely assembled at the factory with burner and all boiler trim installed, it is set on a testing line, connected to service supplies, and fired. During this test firing period, trained technicians thoroughly check on all points of performance and make whatever adjustments are necessary to bring the unit into top operating condition.

Then, and then only, is a Superior Steam Generator shipped . . . with a written guarantee based on the results of this actual test firing. There's no guesswork about Superior Steam Generators. Every guarantee is based on the actual performance of the unit to which it applies.

for performance you can **BANK** *on*

SUPERIOR COMBUSTION INDUSTRIES INC.
TIMES TOWER, TIMES SQUARE, NEW YORK 36, N.Y.

SUPERIOR
STEAM GENERATORS

For more facts circle 636 on Reply Card

(Continued from page 36)

valves with flanged or welding ends and bolted bonnets for 300, 400-600, 900-1500 lb sp classes, also welded bonnet models with welding ends for 1500 and 2500 lb sp classes. Includes discussion on "what you should know about blow-off valves," and gives tips on selection, operation, installation of blow-off valves and boiler code requirements for them. Generously illustrated, this catalog provides tables on material specifications, flanged and welding end details. Edward Valves, Inc.

134 **Jacketed Valves**—Data Units 220 and 221 describe operational features of jacketed valves for heated-cooled gages or wherever small jacketed angle valves are required. Full specifications are included, also cutaway views showing internal construction. Jerguson Gage and Valve Co.

135 **Air-Operated Butterfly Valves**—Bulletin 1701, 12 pp, replacing company's previous catalog, lists specifications of butterfly valve bodies and diaphragm motor operators. Includes tables of allowable pressure differentials to aid in selection of bodies and operators. Industrial Div., Minneapolis-Honeywell Regulator Co.

136 **Solenoid Valves**—Bulletin 500A covers manufacturer's line of solenoid valves for automatic or remote control of steam, air, gas or liquid flow, in sizes from ¼ to 3 in., handle pressures up to 1200 psi (steam to 150 psi). Describes 25 types, giving application, operation, specifications, prices. Discusses waterproof and oilproof solenoid coils for temperatures up to 450 F. J. D. Gould Co.

137 **Steam Traps**—To aid plant engineers and maintenance men select their steam traps, Bulletin 154 gives tables of specifications and capacities of manufacturer's Super-Silvertop traps, including sizes and pipe connections, pressures, weights and list prices. Gives technical data on strainers for pressure regulating valves and metering devices, liquid and gas lines. The V. D. Anderson Co.

138 **Swivel Fittings**—Ball bearing swivel fittings of the universal service type are described and illustrated in 4-pp Catalog FS-101. Covers single-, double- and triple-swing styles in low and high pressure types, high temperature, corrosive service and condensate return types. Gives design details, packing suggestions; includes engineering data. Emsco Mfg. Co.

139 **How to Select Bellows**—Catalog 140, 16 pp, is a design guide for application and selection of bellows. Covers manufacture, typical applications, specifications. Includes vapor pressure temperature curves for bellows assemblies. Flexonics Corp.

VIBRATION CONTROL

140 **Engine Vibration Control** — On-the-job photos and case histories showing how diesel and gas engine vibration problems have been solved are presented in Catalog PS-4. Gives advantages of company's vibration control units; also tells how to select proper isolating medium for the installation, discussing applications for steel spring isolators, rubber and cork. The Korfund Co., Inc.

141 **Shock, Vibration Isolators** — Product Bulletin 538 describes two types of isolators designed to reduce shock and noise caused by impact-type machines, vibration, noise of heavy rotating and reciprocating machinery. Discusses dimensions and loads, installation procedures, variation of natural frequency with load, per cent isolation of vibration for various frequencies and applied loads. The Barry Corp.

WELDING AND MACHINE SHOP EQUIPMENT

142 **Welding Chart**—Here's a colorful and informative hanging chart incorporating nine data charts and 10 photos. The feature chart provides RWMA specifications for spot welding similar and dissimilar metals. Other data charts cover properties of Ampco-Weld, high conductivity alloys, projection welding, conversions on commonly welded metals, etc. Photos show holders, tips, seam welder shafts and other accessories. Ampco Metal, Inc.

143 **Arc Welding Accessories**—This company's 24-pp 1954 catalog of aids to good welding covers electrode holders, helmets, eye shields, ground clamps, cleaning tools, gloves, welding cable, other products. Illustrated with photos, gives application and ordering information. Metal & Thermit Corp.

144 **Blast Cleaning Accessories Guide**—Bulletin 300C is a 28-pp booklet describing accessories and supplies available for use with company's blast cleaning equipment. Includes engineering selection data as well as specifications. Space is also devoted to selection of abrasives according to cleaning requirements. Pangborn Corp.

INSTRUMENTS, CONTROLS

145 **Remote Level Indicators** — Twenty-pp Bulletin WG-1824 contains a complete description of the Yarway remote liquid level indicator. Also gives helpful application, installation and operational information. Photos show typical installations of these indicators on boiler room panels, and wiring diagrams are included. Yarnall-Waring Co.

146 **Transmitter Unit**—Bulletin 9563-M describes and illustrates a pneumatic signal transmitter designed for use with company's ring balance meter. Using a schematic diagram of the operating mechanism, booklet explains how speed, accuracy and stability of the transmitter, in combination with the ring balance meter, provides an instrument adaptable to a wide variety of metering and control applications. Hagan Corp.

147 **Portable Temperature Indicators**—Bulletin A-303-1, 8 pp, describes a potentiometer indicator and resistance thermometer—portable temperature indicators for periodic spot checks of heating units and test furnaces. Describes operating adjustments, test circuits, specifications. Lists standard scales available, covering temperatures from -200 to 2800 F; type of thermocouple or resistance bulb for each range, degrees of temperature indicated by each scale division. The Foxboro Co.

148 **Resistance Thermometer Bulbs** — Sixteen-pp Catalog 5701 describes resistance thermometer bulbs of high speed, room temperature, sanitary and other types for temperature spans as narrow as 20 F. Also included are wet and dry bulb resistance thermometer assemblies designed for the measurement of relative humidity. Industrial Div., Minneapolis-Honeywell Regulator Co.

149 **Dynamometer Systems**—Bulletin GEA-5923, 12 pp, discusses dynamometer systems for testing internal combustion engines, transmissions, torque converters, pumps, electric motors. Tells how d-c dynamometer systems can be used for motoring and absorption applications. Gives data on system's wide speed and torque range capacity for meeting different testing and measuring needs. General Electric Co.

150 **Heating Control for Oil Burners**—Bulletin GEA-6118, 12 pp, fully illustrated, describes, gives step-by-step illustration photos of manufacturer's complete line of oil burner controls. Explains company's heating control exchange plan for inoperative controls. General Electric Co.

151 **Dynamometers**—Bulletin DB-1, 16 pp, illustrates and describes manufacturer's complete line of eddy-current dynamometers, accessories and controls. Includes operating photos, engineering drawings, graphs, tabular material pertaining to some typical installations. Dynamatic Div., Eaton Mfg. Co.

PLANT ENGINEERING

May, 1954

Card void after 4 months.

Please have manufacturers send without obligation information or bulletins indicated by numbers circled.

(Please Print or Typewrite)

Your Name ..... Your Title .....

Your Company Name ..... City ..... State .....

Company Address ..... City ..... State .....

(If you prefer delivery at your home also fill below)

Home Address ..... City ..... State .....

PRODUCTS

DATA FILE

BULLETINS

ADVERTISED PRODUCTS

Use this space to ask for tear sheets, other information wanted.

THIS MONTH'S LITERATURE OF MERIT is on computers . . . handling units . . . conduit fittings . . . preheaters . . . belting

152 A Look at Electronic Machines—"Light on the Future" is a 32-pp pocket size booklet giving significant principles and components of electronic data processing equipment. After brief comparison of construction and application of analogue and digital computers, booklet explains digital computers and describes functions of input, storage, arithmetic, control and output components. Discusses new developments, particularly devices for storage of information, also future possibilities in the field of electronic equipment. International Business Machines Corp.

153 "In-Between" Handling—This informative 20-pp pocket-size booklet covers short distance hydraulic manipulation of materials too heavy for manual handling yet not requiring motor-driven equipment. Provides a measure which plant engineers can apply to their own problems; analyzes integration of in-between handling into present systems, functions it performs best. Also discusses where this type of handling system should and should not be used. Big Joe Mfg. Co.

154 For the Hazardous Spots—An 82-pp reference book, Bulletin 2655 is the 1954 edition of company's catalog on Condulets for hazardous locations. Contains a table listing commercial uses of hazardous substances and their flash points and ignition temperatures; sections of the 1953 National Electrical Code; detailed descriptions of explosion-proof and dust-tight electrical equipment conforming to the Code. Well-illustrated this informative booklet is available to qualified plant engineers. Please state your job title when requesting it. Crouse-Hinds Co.

155 Preheating Combustion Air—This well-illustrated 36-pp booklet explains fuel savings and increased performance made possible by using waste heat in flue gases to preheat incoming combustion air. Also covers increased boiler output, ability to use lower grade fuels, other advantages afforded. Booklet contrasts regenerative with recuperative preheaters; explains operating principle and structural details of the Ljungstrom air preheater. Industrial applications for other than power boilers are covered and layout drawings of typical preheater arrangements are included. Air Preheater Corp.

156 Belting Handbook—Transmission, conveyor and elevator belting are covered in this 28-pp illustrated catalog. In it, each belting product is pictured in color and tabulated as to specifications, construction and recommended use. A section is devoted to formulas and rules used in estimating horsepower requirements. Boston Woven Hose & Rubber Co.

PROTECTIVE COATINGS

157 Air-Curing Coatings—Gaco Bulletin N-700 describes application of an air-curing liquid neoprene protective coating. Points out how it protects against corrosive fumes and splash and is useful for old and new equipment, for general maintenance protection for metal, wood, concrete. Gates Engineering Co.

158 Improved Water Repellent—This 8-pp technical brochure covers theory, applications and benefits of special silicone resin water-repellent compounds for above-grade exterior masonry. Gives comparative ratings of various repellents on the market today. Explains how silicones work, and tells how such water repellents reduce maintenance costs and preserve structures. Includes job specifications. Dewey and Almy Chemical Co.

159 Metal Primer—This folder describes Ospho, a metal primer which is applied right over rust and stops rust action. Tells advantages of Ospho for rusted metal and as a primer for new metal, explaining how it serves to protect the metal. Rusticide Products Co.

HEATING

160 Textile Report—This 22-pp report covers high speed drying and curing of synthetic textile finishes by means of far-infrared radiation. Shows typical tenter frame installations, using electric radiant heat for both drying and curing of the synthetic resin impregnations. Illustrates installations. Edwin L. Wiegand Co.

161 Electric Oil Heaters—Catalog 709A, gives capacity ratings of manufacturer's electric oil heaters for sizes from 2 up to and including 64 KW. Discusses automatic operation, finned tube heating element, company's electric oil preheater. Hauck Mfg. Co.

162 Tubular Electric Heaters—Bulletin 202 describes, illustrates five component parts of company's tubular electric heaters. Explains characteristics of electric heating and operating comparison with steam. Turbine Equipment Co., Hynes Electric Heating Div.

DIESELS, ACCESSORIES

163 Dual-Fuel Engines—Bulletin S-500-B57 36 pp, describes dual-fuel engines for rural generating stations, sewage disposal, private utility, municipal power, industrial power and other applications. Includes photos of each type of installation, along with statistics, case histories and comments on fuel consumption. Space is devoted to each feature—fuel injection pump, automatic fuel switcher, thermal air control, and the gas valve which controls fuel gas supply to power cylinders. Worthington Corp.

164 Stationary Diesels—Bulletin 5303, 8 pp, describes five models of 9 to 54 bhp Lister stationary diesel engines, and one to six cylinders (3.75 by 4.5). Includes design features, specifications, dimensional diagrams. Engine Div., The National Supply Co.

165 Hose for Diesel Engines—Eight-pp Bulletin EH-50 gives descriptive and engineering data on flexible metal hose of diesel engine installations. Covers corrugated exhaust and air-intake hose, corrugated flexible metal diesel hose, interlocked exhaust and air intake hose, and braid-covered seamless flexible tubing. The American Brass Co.

HEAT EXCHANGING

166 Heat Exchangers—Form 533012 is a 36-pp catalog covering commercial and industrial heat exchangers. Gives capacities, sizes, dimensions and weights of fuel oil heaters, condensate coolers, water heaters for large steel boilers, tank heating units, converters. Taco Heaters, Inc.

167 Heat Exchangers—Bulletin 120 describes operation of company's Aero heat exchangers for cooling or controlling temperatures of industrial liquids. Diagrams and photos show equipment in operation, examples of application. Niagara Blower Co.

168 Heat Transfer Equipment—Eight-pp Bulletin 600-2 explains how company's heat transfer equipment is tailored for individual performance specifications in heating, cooling of corrosive or non-corrosive liquids and gases. Illustrates different types and unit combinations. Industrial Filter & Pump Mfg. Co.

BUSINESS REPLY CARD
No Postage Stamp Necessary If Mailed in the United States

Postage will be paid by

PLANT ENGINEERING
110 South Dearborn
CHICAGO 3, ILLINOIS

FIRST CLASS
PERMIT No. 353
Sec. 34.9 P. L. & R.
CHICAGO, ILL.

DATA FILE of literature for the plant engineer's library

STANDARD CATALOGS, bulletins and handbooks are listed to help plant engineers maintain a permanent data file. To get these free catalogs, circle item numbers of those wanted on postage-free cards provided on pages 35-36 and 219-220.

OTHER EQUIPMENT

169 **Sound Products**—Form 2R8348 (rev.) is a 20-pp catalog listing manufacturer's sound equipment. It is divided into sections dealing with microphones, amplifiers, speakers, intercommunication equipment, etc. designed to meet needs from portable systems to large sound installations. Descriptions of each model include information on special features, uses, specifications and photos. Sound Products Section, Radio Corp. of America.

170 **Rupture Discs**—Catalog 77-30, 6 pp fully illustrated gives construction features of a rupture disc for low pressure and highly corrosive applications, sizes 2 through 10 in., and rupture pressures from 5 to 100 psig. Discusses operation, pressure ranges, manufacturing tolerance. Black, Sivalls & Bryson, Inc.

171 **Quick-Opening Doors** — Bulletin 2435, 8 pp, outlines advantages of newly developed quick opening doors for pressure vessels. Explains how these doors can be opened and closed in seconds, and are adaptable to both vertical and horizontal units. Process Equipment Dept., Blaw-Knox Co.

172 **Many Mouths to Feed?**—This comprehensive 58-pp booklet on in-plant feeding offers a practical approach to the problem of industrial food service. An opening chapter on food service policy covers plant area and distribution of employees, length and number of meals, menu policy, capital investment, and leasing out of food service facilities. Other chapters deal with types of industrial food services, space requirements, preliminary and final layouts, equipment selection and responsibilities of service personnel. Hotpoint Co.

173 **For Hot Underground Pipes**—Tips on installation of Gilsulate, a triple-zone insulation for hot underground pipes, are given in this illustrated bulletin. Shows how Gilsulate is poured around pipes, tamped down, and the trenches backfilled. Explains protection afforded, details advantages and includes technical data. American Gilsonite Co.

174 **Bulk Gas Delivery System**—Form ADC 663, 16 pp, describes company's system of delivering bulk oxygen units to consumer's plant. Lists advantages of low capital investment and operating cost, elimination of cylinder handling and residual oxygen costs, accurate method of consumption. Diagrams show straight and diagonal parking requirements of delivery units. Air Reduction Sales Co.

175 **How to Get the Right Washer**—Sixteen pp of helpful information and pictures on the manufacture and availability of metal and fiber washers, both standard and special, are provided in this booklet. Contains data on general washer characteristics, tolerances, and facilities for meeting individual requirements. H. K. Metalcraft Mfg. Co.

176 **Dust Control in Paint Manufacture**—Bulletin 422, 12 pp, features four case histories on control of dust conditions due to mixing, blending, crushing and grinding, by local exhaust ventilation using Dustube dust collectors (cloth-tube-type). Lists advantages of savings in material expense, improved working conditions, better color purity in finished paints. American Wheelabrator & Equipment Co.

178 **Controlled Volume Pumping**—Bulletin 440, 24-pp, describes company's line of Pulsafeeder diaphragm-type controlled volume pumps, stressing the maintenance free feature of no stuffing box. Emphasizes multiple functions of pump such as chemical feeder, meter, filling machine—also versatility on hard-to-handle chemicals. Describes manual and automatically-controlled types, giving capacities, sizes, specifications, rating tables. Process Equipment Div., Lapp Insulator Co., Inc.

179 **Weed Control**—Low cost weed and grass control with "Telvar" W (formerly CMU) weed killer is discussed in Bulletin A-6644, 12 pp, full color. Illustrates some uses of this wettable powder at industrial plants, along railroad trestles, around electrical installations. Gives directions for application. E. I. du Pont de Nemours & Co.

180 **Rubber Linings**—This 8-pp bulletin describes advantages and application of manufacturer's various rubber linings to steel tanks, drums, pipes, valves, fittings and pumps. Includes tables giving resistance characteristics of rubber lining to inorganic acids, salts and alkalies, organic materials. Protective Coatings Div., Metalweld, Inc.

INSTRUMENTS, CONTROLS

201 **Handbook on Automatic Controls** — Catalog 700 provides 45 pp of ordering and application data on automatic controls with mercury contact switches. Covers control equipment for temperature pressure-low water, liquid level bottles; transformer-relays, valves. The Mercoid Corp.

202 **For Liquids Worth Storing** — Bulletin 6405 offers an illustrated discussion of company's self-contained gages for liquid level applications, covering both direct- and remote-reading types, also a dial type hydrostatic gage. Stresses value of measuring stored liquids. Liquidometer Corp.

203 **Wide Range Regulator** — Featured in Bulletin 316 is an expansion stem type temperature regulator operated by water or compressed air. Explains how regulator works. The Powers Regulator Co.

204 **Gages for Many Jobs**—Sixty-eight pp of liberally illustrated information is offered in Catalog 64. Describes a variety of gage types; air volume controls for pump installations, vapor tension thermometers, d-c ammeters and voltmeters, and water flow meters covered. Includes engineering tables. U. S. Gauge Div., American Machine and Metals Inc.

205 **Electronic Controls** — Eight-pp Catalog F 6166 describes flexibility of an electronic control system for heating, ventilating and air conditioning. Describes temperature controls, control panel, sensing elements, as well as the ultra-sensitive micro relay which simplifies the amplifier. Barber-Colman Co.

206 **Control Centers**—Advantages of control centers and their versatility are discussed in this 28-pp booklet. Illustrated with photos and full-colored drawing, booklet shows 10 typical installations of control centers and explains how this equipment can lower costs. Design and construction features are explained, and three basic NEMA types of construction described. Electrical and mechanical construction details are shown, typical specifications provided and handy space requirement tables included. The Clark Controller Co.

207 **Square Design Cylinders**—Illustrated 8-pp Bulletin H-104G gives engineering, design, construction, mounting and dimensional data on a line of space-saving square-design hydraulic cylinders for 2000-3000 psi operation. Arrangement of these data permits quick selection of desired model and bore size and the obtaining of complete mounting and dimensions for model selected. Bulletin covers 13 mounting styles. Miller Fluid Power Co.

208 **Portable Scales**—Form 2004 describes company's new 200 series of scales, presenting both bench and full-height models. Stresses larger platform, new locking mechanism, other advantages of these scales for use on receiving dock, in manufacturing processes, shipping rooms. Toledo Scale Co.

ELECTRICAL EQUIPMENT

209 **Motor-Generator Reference Book**—Publication 51R7933 is a 50-pp booklet compiled to assist in the selection of motive power to handle most industrial applications. Neither text book nor ordering catalog, this book provides a brief outline of the various types of motors, generators and motor-generator sets, telling their application and operating requirements. Booklet is generously illustrated and includes performance data, ratings, information on methods of speed control. Allis-Chalmers Mfg. Co.

210 **Motor Controls** — In this 28-pp bulletin the most important items in company's line of standard motor control apparatus for all industries are presented. Controls, starters and accessories are described and applications listed. Allen-Bradley Co.

211 **Variable Speed Motors**—Sixteen-pp Bulletin 1797, revised, outlines many reasons why variable speed motors can be used to improve production, and it includes illustrations of all types of company's Varidrive motors, as well as their mechanical features, remote controls, etc. U. S. Electrical Motors, Inc.

212 **Productive Maintenance — Publication** GED-1691 is a pocket-size 104-pp source of information of value to plant engineers who want to get more production from their present motors, generators and control equipment. Besides general maintenance suggestions, the booklet contains trouble shooting charts and recommended renewal parts guides. Also provides wire and cable data and includes a section of formulas and other data pertaining to motors and generators. General Electric Co.

213 **The Answers on Wiring**—"20 Questions and 20 Answers on Safety m.i. Wiring" describes and illustrates characteristics and advantages of this new wiring system. A complete table of types, sizes, weights and lengths, as well as a partial list of users included. General Cable Corp.

214 **Bus Duct Manual**—Booklet B-4272A, 68 pp, on bus duct and accessories, presents application and test data, specifications, information on pricing a typical installation. Describes advantages of bus duct or a secondary power distribution system, carrying current from transformers to switchgear—and from there to motors. Westinghouse Electric Corp.

215 **Plug-In Power**—Sixty-pp Catalog 25 offers real help on electrical installation problems involving portable tools, materials handling equipment, cranes, hoists, cutting equipment. Covers a prefabricated trolley busway electrical distribution system to provide outlets for power or light where needed. Feedrail Corp.

216 **Power and Control Cables** — Sixty-pp Catalog 24 describes typical power and control cable designs and is intended as a guide in selecting proper wire and cable type. Describes insulations, sheaths and coverings, electrostatic shielding, and includes product data on all types listed. Rome Cable Corp.

217 **FHP Manual Starters**—Bulletin 224 is a folder giving the features and ratings of a line of fhp starters. Lists applications for these starters and pictures enclosures. Square D Co.

218 **Handbook on Storage Batteries**—This 64-pp booklet of instructions and technical data is the sixth edition of this company's battery service manual. Provides a brief treatise on the theory of the lead-acid battery. Gives detailed instruction on the care and operation of batteries, on maintenance and repairs, and on standard and special parts. Booklet is of special value to plant engineers concerned with storage batteries for cycle service in industrial trucks and materials handling equipment. Gould-National Batteries, Inc.

219 **Industrial Truck Batteries** — Bulletin IT-520 covers company's complete line of industrial truck batteries and gives details such as dimensions, wet and dry weights, types of containers, and capacities at the 6- and 8-hr rate. C&D Batteries, Inc.

220 **What You Should Know About Circuit Breakers** — Sixteen-pp Manual 101 explains operating principles of basic circuit breaker designs and provides engineering data on factors of application. Includes simplified diagrams of three basic types. Illustrates with colored charts and diagrams, explains temperature factors, inrush current effects, tripping and reset time. Heinemann Electric Co.

221 **Snap Action Switches**—Catalog 82, 23 pp, on precision snap-action switches, presents safety limit, and interlock types designed especially for switching a-c circuits in indus-

If you need

you need

UCON

Trade-Mark

FLUIDS and LUBRICANTS

WHY? Because these synthetic fluids and lubricants are completely different from animal, vegetable, and mineral oils. They have all the desirable properties of high-grade lubricating oils, plus remarkable properties of their own:

- High viscosity indexes
- Low pour points
- Excellent lubricity
- Sludge resistance
- Non-carbonizing
- Non-corrosive to metals
- Unusual solvent action
- Negligible effect on rubber
- Wax-free
- Sulfur-free
- Non-toxic

UCON fluids and lubricants are supplied in both *water-soluble* and water-insoluble series—with or without additives. Viscosities range from 50 to between 60,000 and 90,000 S.U.S. at 100°F.

Write today for complete information on UCON fluids and lubricants.

Carbide and Carbon Chemicals Company

A Division of

Union Carbide and Carbon Corporation

UCC

30 East 42nd Street, New York 17, N.Y.

"Ucon" is a registered trade-mark of Union Carbide and Carbon Corporation.

For more facts circle 637 on Reply Card

DATA FILE

(Begins on page 221)

trial applications. Covers heavy-duty limit switches, metal enclosed switches, some of which are sealed against dirt, dust. Micro Div., Minneapolis-Honeywell Regulator Co.

222 **Metal-Clad Switchgear**—Bulletin 7004B is a 24-pp booklet on company's Multumite horizontal drawout switchgear for switching, control, and protection of generators, motors, transformers, feeder circuits, incoming lines and tie circuits. Explains and illustrates construction details, stressing circuit breaker design. Shows how air circuit breaker protects, and is built for safe, easy handling. Includes check list covering what a plant engineer should know to take advantage of basic standard assemblies. I-T-E Circuit Breaker Co.

223 **Flexible Cords**—This well-illustrated 24-pp booklet includes all new Underwriters' classifications for flexible cords manufactured by this company. Featuring data on Dynaprene and rubber jacketed cords as well as braid covered types, also gives tips on how to select proper cord. Whitney Blake Co.

224 **Retractile Cords**—This 8-pp bulletin presents retractile cords for general communication and power applications. Containing catalog data and ordering information as well as application photos, explains how the cords are made, where used, and advantages offered. Koiled Kords, Inc.

LIGHTING, COMMUNICATION

225 **Precision Lamps**—Bulletin 40 offers application and purchasing information on various types of lamps carried by manufacturer. Flood, infra-red, spatterproof, and weatherproof lamps are briefly discussed. Radiant Lamp Corp.

226 **Lighting Fixtures**—New Section K of Condulet Catalog 3000 describes components, performance data, and methods of relamping for any of the manufacturer's new EV series explosion-proof and weather resistant lighting fixtures. It contains illustrations showing steps for easiest relamping and installation of this type of fixture. Crouse-Hinds Co.

227 **Selection Data on Lighting Fixture Hangers**—Catalog 50. 80 pp. contains general and detailed information on disconnecting and lowering lighting fixture hangers, accessories, special devices and parts. Utilizes 247 photos and drawings to show construction principles, operating features, installations, modifications and component parts for both indoor and outdoor units. The Thompson Electric Co.

The two Reader Service Cards on pages 35 and 219 are easy to use and need no postage. Just circle the item number of catalogs wanted.

228 **For Emergency Lighting**—This bulletin tells how to prevent sudden lighting in failure with the Exide Lightguard, designed to turn on a powerful floodlight when normal current fails. Stresses ease of use, other merits; gives dimensions. The Electric Storage Battery Co.

229 **Lighting Fixtures**—Full information on company's fluorescent lighting fixtures designed for efficient industrial lighting and reduced maintenance is provided in Form OD-568. Day-Brite Lighting, Inc.

230 **Supervision by Television**—Advantages of manufacturer's industrial television, as given in Bulletin 2J8837, 8 pp, are accuracy, operating simplicity, and safety and convenience. Describes, illustrates the two units—camera and control monitor—which make up the industrial TV chain. Discusses accessory equipment for special applications, and gives planning information. Radio Corp. of America.

231 **How to Use Sound Signals**—This new 44-pp combination manual, data book and catalog is an excellent reference work on industrial sound signals. Includes a simplified explanation of fundamentals of sound; a glossary of sound and signal terminology; a quick-comparison guide for selecting equipment; suggested steps in choosing a signal installation, and hints for compiling a code signal call system. Benjamin Electric Mfg. Co.

VALVES, TRAPS, PIPING AND ACCESSORIES

232 **Bronze Valves**—Globe and angle bronze valves with rising stems, union bonnets and stainless steel plug type seats and discs are described in this bulletin. Discusses design advantages, gives dimensions and specifications. Walworth Co.

233 **For Quick Valve Selection**—Here's a 20-pp catalog digest providing ordering and application information on gate, globe, angle and check valves in bronze, iron, cast and forged steel construction, also valve accessories and parts. Illustrated and thumb-indexed, includes pressure-temperature chart. The Ohio Injector Co.

234 **Valve Maintenance Guide**—"Prevent Valve Failure Before It Starts," is a 28-pp text on valve selection, installation, inspection. Pictures damaged valves, explains how damage could have been prevented, discusses maintenance schedules, inspection jobs, lubrication, pipe line checking, threading, regrinding, disc replacement. Jenkins Bros.

235 **Valves and Fittings**—Illustrated Catalog 47 provides over 60-pp of ordering information and application data on valves and fittings made of stainless steel and other corrosion resistant alloys designed for use where corrosion or contamination are factors. Gate, globe, and angle valves for a wide range of services are presented, also needle valves, sampling valves, screwed and flanged fittings. Design and construction details are shown. Also included is a chart of first and second recommendations of alloys for corrosive media. Alloy Steel Products Co., Inc.

236 **Reducing Valve Engineering Data**—Bulletin 962 explains how the contour of a pressure reducing valve contributes to efficiency of performance. Discusses straightline flow, tight closing. A. W. Cash Co.

237 **Improved Steam Valve**—This bulletin describes and illustrates the new Ostlind valve designed to eliminate leakage, unbalanced flow and other causes of valve failure. Shows how valve is designed, explains how it operates, and tells how it should be installed. The Richmond Foundry & Mfg. Co.

238 **Steam Trap Book**—Catalog J, 44 pp, includes physical data and prices on cast semi-steel and forged steel inverted bucket steam traps, compound steam traps and ball float air and air relief traps; a handbook section explaining how to calculate condensate loads and select traps for all classes of equipment; a maintenance section. Armstrong Machine Works.

239 **Steam, Air and Gasoline Traps**—Catalog 751, 32 pp, is a recently issued trap ordering book with capacity tables, installation diagrams, and containing charts and formulas for determining proper size trap for specific applications. Covers thermostatic steam traps, expansion steam traps, weight-operated traps for steam, air, gasoline, pressures up to 1500 lb; separators. W. H. Nicholson & Co.

240 **Solving Steam Trap Problems**—This popular 36-pp catalog on steam traps contains specifications and capacities on steam traps, float traps, air release valves and pipe line strainers. Tells how to calculate condensation loads and select traps for all classes of equipment, including unit heaters, jacketed kettles, autoclaves, submerged drips. Gives pointers on how to install traps and service them. The V. D. Anderson Co.

241 **Steam Trap Reference Manual**—Bulletin T-1740, 24 pp, tells why and where steam traps should be used; explains desirable trap features. Advantages of company's impulse steam traps are described, their operation illustrated. How to figure trap sizes and how to size condensate return lines are told and capacity and pipe dimension charts and ther-

CARING FOR WAXED FLOORS IS . . .

A cinch with Sanax

It waxes as it cleans!

REDUCES THE FREQUENCY OF REFINISHING

Sanax was developed to permit frequent cleaning of waxed floors *without washing away the finish* . . . and to eliminate waste in wax and labor. A neutral liquid soap with a wax base, *Sanax* not only quickly removes dirt, oil, and grease, but *leaves a thin film of wax.* In fact, regular use of *Sanax* to machine-scrub or damp-mop waxed floors *actually prolongs the life of the finish,* and thereby reduces refinishing costs on a year-to-year basis.

Like all *Finnell Fast-Acting Cleansers, Sanax* is specially designed for the greater speed of machine-scrubbing, and works as effectually in a *Combination Scrubber-Vac* as in a *Conventional Scrubber-Polisher.* And because *Sanax* is processed from pure vegetable oils, it's *safe for all floors.*

A 100 Series General-Purpose Finnell 11, 13, 15, 18"

Find out how you can simplify and reduce the cost of caring for waxed floors. *There's a Finnell Floor Specialist nearby* to help you choose the waxes and cleansers that are *exactly right for your needs. Finnell* makes a complete line, so you can depend on unbiased advice. In fact, *Finnell makes everything for floor care!* For consultation, demonstration, or literature, phone or write nearest *Finnell Branch* or Finnell System, Inc., 5305 East Street, Elkhart, Indiana. Branch Offices in all principal cities of the United States and Canada.

- **A mild liquid wax-soap for machine-scrubbing or damp-mopping waxed floors**
- **Leaves a lustrous anti-skid protective finish**
- **Highly concentrated . . . economical to use**

FINNELL SYSTEM, INC.

Originators of Power Scrubbing and Polishing Machines

Everything FINNELL for Floor Care

BRANCHES IN ALL PRINCIPAL CITIES

For more facts circle 638 on Reply Card

C&D Batteries for *extra* work!

Food Fair Stores, Inc., one of America's fastest growing food chains, is currently ringing up sales at the rate of $400,000,000 a year. To help handle the millions of pounds of dry groceries, meat, produce, and other products that move through the company's warehouses every week, Food Fair uses C&D Slyver-Clad* batteries as a major source of power in their industrial trucks. For Food Fair, like hundreds of other leading American companies has found it pays to power with C&D Slyver-Clad batteries.

C&D Slyver-Clad batteries are approved as standard equipment by all electric truck manufacturers. For further information, write for catalogs.

*TM Reg.

C&D

BATTERIES, INC.

of Conshohocken, Pa.

Manufacturers of Industrial Batteries since 1906

SALES AND SERVICE OFFICES IN PRINCIPAL CITIES FROM COAST TO COAST

For more facts circle 639 on Reply Card

DATA FILE

(Begins on page 221)

modynamic properties of saturated steam included. Yarnall-Waring Co.

242 **Packless Expansion Joints**—Bulletin 35-51A offers 28 pp of up-to-date information on company's Corruflex joints, their design and installation and advantages over other means of providing for thermal expansion in pipelines. Construction features are explained and illustrated; simplified selection data include tables for determining amount of expansion in pipelines. American District Steam Co., Inc.

243 **Welded Fittings**—Catalog 3 is a 36-pp ordering and engineering reference book on company's Weldolets for piping services. Gives data on butt-welding and socket welding Weldolets as well as on Thredolets for making threaded outlets. Typical installations are pictured; sizes, weights and prices provided. Also included are installation instructions and a technical section. Bonney Forge & Tool Works.

244 **Corrosion-Resistant Fittings** — Light-wall pipe fittings described in this 24-pp catalog, feature the tangential section as a new concept in piping. Booklet explains how these fittings reduce initial costs and simplify piping installations, are readily adjustable to existing pipelines and valves, pumps and plant equipment. Gives size ranges, dimensions, tolerances test data, accessory equipment, charts, tables, methods and general information on soldering. Horace T. Potts Co.

245 **Unions and Fittings**—Twelve-pp Catalog 50 covers manufacturer's line of unions of all types, elbows, tees, fittings. Dart Union Co.

246 **Expansion Joint Design Guide**—Bulletin 135, 24-pp, contains engineering application and selection data on pipeline expansion joints. The guide features a discussion of the types of expansion joints available and kinds of pipeline motion solved by them. Also covered are expansion joint design considerations and installation instructions. Includes schematic piping layout. Flexonics Corp.

247 **Jacketed Piping, Cocks**—Twelve-pp Bulletin 152 discusses the special advantages, problems and requirements of jacketed piping installations and shows how manufacturer's jacketed piping, cocks, fittings and relief valves are designed to fulfill requirements. Illustrated with photos and drawings, includes specifications. Parks-Cramer Co.

248 **Piping Pointers** — This is company's popular piping manual covering fundamentals of sound piping practices. Discusses various types of valve designs and how each should be used. Pictures and names more than 80 kinds of fittings and contains many illustrated how-to-do-it features. Included with the manual is an 8-pp valve selection guide. Crane Co.

249 **Wrought Iron for Piping**—This 32-pp booklet covers commonly used pipe materials and method of selecting them for specific types of service in modern building construction. Discusses wrought iron, cast iron and steel pipe, also copper and brass pipe, and the factors entering into the relative costs of piping materials. Pipe selection is treated, with emphasis on corrosion resistance. A. M. Byers Co.

PUMPS, COMPRESSORS

250 **Installing a Pump** — Blaming many pump operating troubles on improper pump selection and installation, this 8-pp technical article tells what should be taken into consideration when ordering a pump. Titled, "Studying the Installation," it discusses head, viscosity, pipe friction, suction lifts, horsepower and materials. Illustrated. Viking Pump Co.

251 **Cradle-Mounted Pumps** — Sixteen-pp Form 7223, covering general purpose centrifugal pumps of the cradle-mounted type, presents five basic groups and 17 corresponding pump types, their capacities, horsepower ratings and uses. Includes dimensions and a table of performance under 60 cycle use. Ingersoll-Rand Co.

252 **How to Solve Pumping Problems**—A new printing of this popular 36-pp booklet

...*SPEEDLINE* FITTINGS MAKE THE DIFFERENCE AT INDIANA FERTILIZER PLANT

Cost breakdown on this recently completed stainless steel piping installation reveals 96.8% of the total expenditure was for materials . . . only 3.2% for labor!

Impossible? Not with a SPEEDLINE system!

These are the actual figures reported by H. E. Little, Plant Superintendent at E. Rauh and Sons Fertilizer Company, Indianapolis, where SPEEDLINE fittings were used on a new phosphoric acid line. Aligning connectors and formed fittings with exclusive SPEEDLINE tangential simplified installation . . . cut labor time and costs to a bare minimum.

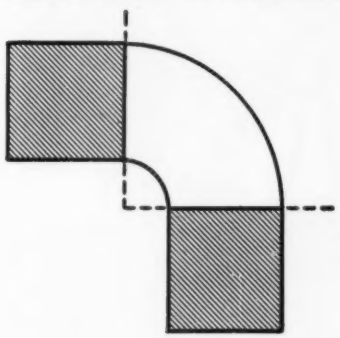
E. Rauh and Sons saved on material costs, too. Plant Engineer was able to use low cost schedule 5 pipe for the entire line—without loss of effective wall for pressure and flow requirements. Intergranular corrosion problems were solved by correct analysis, rather than needless additional pipe wall.

The results? Savings of nearly 50% in material costs as compared to using schedule 40 pipe with conventional screwed fittings—plus greater flow and increased capacity!

Light-wall pipe with SPEEDLINE corrosion-resistant fittings can also cut piping costs at your plant.

Designed especially for economical schedules 5 and 10 pipe SPEEDLINE fittings, speed installation, provide easier aligning and greater flexibility of design to reduce your costs right down the line.

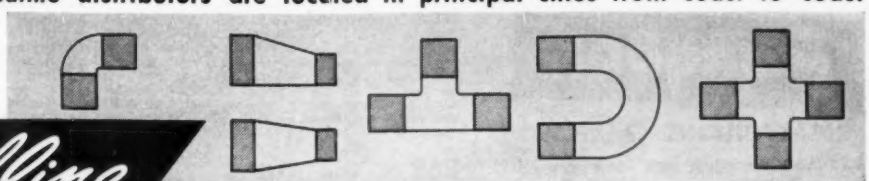
The drawing shows a SPEEDLINE 90° Elbow. The dotted lines show the termination points of conventional fittings. The additional straight section of SPEEDLINE



fittings permits attaching of unions or flanges (as in photo above) without fouling, reduces the number of welds required, and eliminates troublesome curved or angle joints.

Write for a copy of "Speedline Fittings"...without obligation.

***Speedline* distributors are located in principal cities from coast to coast**



Speedline

Corrosion-Resistant FITTINGS—the newest thing in pipeline economy

Manufactured by **HORACE T. POTTS CO.** · 544 E. Erie Avenue · Philadelphia 34, Penna.

For more facts circle 640 on Reply Card

Remove Scale, Rust, Dirt, Paint

by Blast Cleaning

— on bridges, tanks, buildings, hulls, structural metal, sheets and plates — with this Pangborn Blast Cleaning Machine.

—Six types, stationary or portable, deliver efficient, low-cost maintenance in any plant. $188 and up.

For details, write: PANGBORN CORP., 3200 Pangborn Blvd., Hagerstown, Maryland.

Pangborn

BLAST CLEANS CHEAPER

with the right equipment for every job

Pangborn's 50th Anniversary
1904 - 1954

For more facts circle 641 on Reply Card

DATA FILE

(Begins on page 221)

makes it again available to plant engineers. Filled with helpful technical information, explains design and operation of rotary gear pumps and discusses factors of pumping problems, covering some sample ones in detail. Illustrated, provides friction loss and conversion tables, electrical data, viscosities of liquids, construction materials for handling various liquids, resistance of valves and fittings to flow of fluids. Geo. D. Roper Corp.

253 **Pump Service Manual**—Bulletin 202 is a 20-pp booklet covering installation, operation and maintenance of manufacturer's reciprocating pumps and providing helpful engineering information. Suction piping, valves and accessories for proper operation are discussed. Sectional drawings and parts lists are provided, also high and low capacity steam consumption curves, information on water, properties of steam. Warren Steam Pump Co., Inc.

254 **Centrifugal Compressors** — Twelve-pp Bulletin 109 describes and pictures single-stage centrifugal compressors for delivering large capacities of pulsation-free air or gases. Their functions, applications, ratings, construction features, arrangements and methods of control are presented. American Blower Corp.

255 **Multi-Stage Compressors**—Featured in 36-pp Bulletin 116 is a presentation of engineering data and performance characteristics to enable plant engineers to approximate power requirements, rotative speed and discharge temperature for most multi-stage centrifugal compressor applications. Clark Bros. Co., Inc.

256 **Air Compressor Selection Data**—Factors to be considered in selecting a compressor are discussed and selector charts provided in 20-pp Bulletin IDC 9302-3, covering manufacturer's Y and G air compressors. The Y line includes tank mounted and bedplate units, single- and two-stage types. Special features of each model are described, dimensions and ratings given. Westinghouse Air Brake Co.

PACKINGS, GASKETS, SEALS

257 **Packings and Gaskets**—In this 40-pp belting and packing manual (NY-2697-P) are helpful charts plus information on the care, use and maintenance of rod and sheet packings and gaskets. A complete engineering section contains all necessary charts and tables for determining working specifications of packings. Also included are packing recommendation charts. New York Belting and Packing Co.

258 **Long Wearing Piston Packing**—Form 4502, 8 pp, presents composition cups for packing pistons of air and hydraulic cylinder and reciprocating pumps. Engineering information covers properties, textures, temperature and pressure data, sizes. Darling Valve & Mfg. Co.

259 **Braided Rod Packing**—This 8-pp bulletin outlines advantages of company's lattice-braid rod packing. Contains sectional drawings, showing their unique structure, illustration of types available, tables of service recommendations, specifications. The Garlock Packing Co.

260 **Metallic Packing**—This folder is devoted to company's elastic metallic packing intended for frictionless operation by means of an oil seal. Photos and text tell how seal is constructed, operates and is used. A. W. Chesterton Co.

LUBRICANTS, LUBRICATION

261 **Cooperative Technical Consultation Service**—This 24-pp booklet presents company's periodic consultation service offered to industrial plants and aimed at efficient use of petroleum products. Covers services available in solution of lubrication problems, metal-working operations, processing, fuel and heating oils, dust control. Gulf Oil Corp., Gulf Refining Co.

262 **Centralized Lubrication** — Featuring selection charts covering low and high pressure fluid lubrication systems for a wide range of industries and providing an explanation of operating principles of various types of systems, 24-pp Catalog 80 covers company's lubricant application equipment. Describes and pictures lubricant pumps, transfer and dispensing equipment. Lincoln Engineering Co.

263 **High Temp Lubrication**—How "dag" colloidal graphite has been used successfully in various lubricating applications involving temperatures up to and over 2000 F is described in Bulletin 423. Acheson Colloids Co.

264 **Lubricant Data Book**—This pocket-size 56-pp booklet gives product information and principal uses of approximately 40 lubricants of both grease and fluid types, and general directions for proper application. Discusses lubricant requirements of equipment in 25 major industries. Lubriplate Div., Fiske Bros. Refining Co.

265 **Automatic Lubrication** — Sixteen-pp Catalog L-52 describes force feed lubricators for all types of machinery. Illustrated, gives full design and construction details on company's open and enclosed type lubricators, available in capacities from 2 to 32 pints with 1 to 24 feeds per unit. Hills-McCanna Co.

TOOLS, WELDING AND MACHINE SHOP EQUIPMENT

266 **Pipe Tool Book** — This catalog and data book gives information on pipe and bolt machines, power units, ratchet threaders, reamers and cutters, other power and hand tools. Includes popular "operating guide" section, fully illustrated with easy-to-grasp drawings. Beaver Pipe Tools, Inc.

267 **Pipe Tool Ordering Guide** — Catalog 2-51, 8-pp, covers company's line of threaders, cutters, vises, dies, tongs and wrenches; gives prices. Armstrong Bros. Tool Co.

268 **Tools for Mechanics**—Catalog U is a 106-pp ordering book covering a wide range of power and hand tools for production, maintenance and service work. Describes, pictures and gives application tips and sizes on wrenches of all types, pullers, drills, sanders, polishers, grinders, reamers, taps and dies, testing tools, soldering irons, tool sets, benches and cabinets. Includes price list. Snap-on Tools Corp.

269 **Machine Tools, Their Lubrication**—A history of machine tools, an explanation of their mechanical aspects and an analysis of the role of lubricants in their maintenance and operation are contained in this 80-pp booklet. Not a manual on tool lubrication, this book is a comprehensive discussion of fundamental factors in the construction, operation and maintenance of modern machine tools. Shows how power is controlled and force directed to shape metal by cutting and chipping; analyzes factors that contribute to friction and wear; and describes role of lubricants. Shell Oil Co.

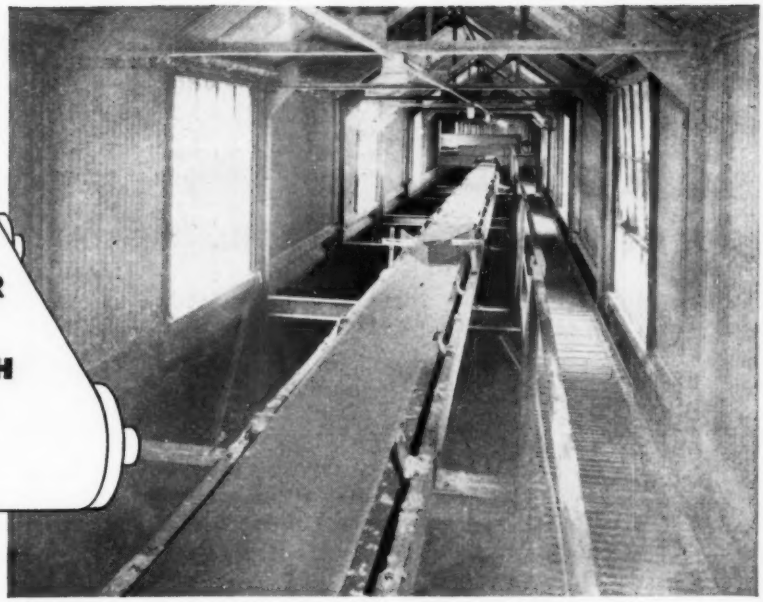
To order these catalogs circle item numbers on the handy Reader Service Cards on pages 35-36 and 219-220.

270 **Resistance Welding**—Featured in this 24-pp catalog are newly-designed tips and holders recently added to company's equipment. Full information is also given about other holders, tips, seam welder wheels and shafts and bushings, in manufacturer's line, as well as flash, butt, barrel and other welding dies. Ampco Metal, Inc.

271 **Automatic Flame Cutting**—This 12-pp article titled "Advanced Automatic Flame Cutting for Machinery Weldments," tells how a power shovel manufacturer converted from castings and riveted structures to weldments. Discusses problems involved in this change, tracing development and utilization of chain type flame cutting in the fabrication of units for power shovels. Tells how use of electronic tracer can improve flame cutting flexibility and increase production capacity while reducing cost of parts. Air Reduction Sales Co.

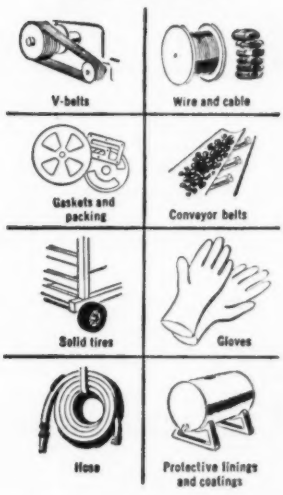
272 **Metal Spraying Gun**—Company's Type 4E gun for high-speed spraying with all metals is described in Bulletin 94. A cutaway drawing shows construction features of the gun which is designed for tool-post mounting or hand operation. Metallizing Engineering Co., Inc.

BETTER RUBBER PRODUCTS ARE MADE WITH DU PONT NEOPRENE



Neoprene conveyor belt lasts 4 times longer than other types . . . saves $4,800 for plant

SPECIFY NEOPRENE IN THESE PRODUCTS:



At a large California seed-processing plant, ordinary conveyor belts lasted only two years at most. Attack by oils from cottonseed, flax seed and soya beans separated the belt plies and caused surface blisters. And the V-shaped wooden "plows"—used to nudge seeds off the belt into storage bins—snagged the blisters and tore the belt covers.

Then a 5-ply belt with a neoprene cover was installed. After eight years the neoprene belt shows no signs of deterioration or serious wear—*four times the service life of the other belts.* And its condition indicates it will be good for another two to four years! The saving on this one belt alone is already $4,800—another example of how neoprene's retention of abrasion resistance even after severe exposure to oil and grease saves on replacement costs.

Longer service is typical of the important advantages that thousands of neoprene products are bringing industry today. While Du Pont makes no finished products of neoprene, your supplier of rubber goods will gladly tell you about the neoprene products he sells.

MAIL THIS COUPON TODAY

FREE! THE NEOPRENE NOTEBOOK—Every issue describes new products, unusual applications of neoprene . . . shows how neoprene cuts maintenance costs. Clip and mail this coupon to get on the mailing list. E. I. du Pont de Nemours & Co. (Inc.), Rubber Chemicals Division PE-5, Wilmington 98, Delaware.

Name_____ Position_____

Firm_____

Address_____

City_____ State_____

NEOPRENE

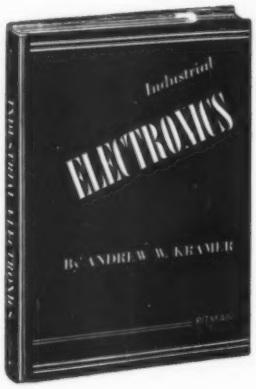
The Rubber Made by Du Pont Since 1932

DU PONT

REG. U.S. PAT. OFF.

BETTER THINGS FOR BETTER LIVING ...THROUGH CHEMISTRY

For more facts circle 642 on Reply Card



a practical new book about Electron Tubes

. . . what they are
. . . how they work
. . . how they can be used
. . . what they can mean to you

INDUSTRIAL ELECTRONICS

by Andrew W. Kramer

This new book explains in clear, simple, non-technical style the basic principles of electronics, and how these principles can be applied in industry. Electronics has been solving the unsolved problems. Whether it is navy beans, opening doors at a shadow, or measuring the thickness of red-hot steel plates, the electron is the newest and most efficient force captured by science. This book should be invaluable for the practical maintenance or operating executive or engineer. 311 pages, 229 illustrations, $6.00.

CHAPTER HEADINGS: Electron Behavior, Fundamental Principles of Electron Tube. The Simplest Thermionic Tube—the Diode. The Triode. Further Aspects of Triode Characteristics and Operation. Electronic Generation of Electric Oscillations. Multielement Tubes. Effect of Gas in a Tube. Types of Characteristics of Gas-filled Tubes. Mercury-pool Tubes. Photoelectric Tubes and Cells. Cold-cathode Tubes. Special-purpose Tubes. What Tubes Can Do. Electronic Control and Regulation. Application of Electron-tube Rectifiers. Electronics in Instrumentation and Measurement. Industrial Applications of Electronic Control. Application of Electronic Regulation. Electron Tubes in Light Production. Miscellaneous Electronic Applications.

Send Your Orders to

BOOK DEPT.

PLANT ENGINEERING

110 SOUTH DEARBORN STREET

CHICAGO 3, ILLINOIS

DATA FILE

(Begins on page 221)

273 **Improved Cutting Oils**—Cutting oils for keeping parts and tools up to 50 deg cooler and representing a new concept in non-emulsifying oils are described in two new technical bulletins. Form A-2724 describes Sunicut 11-S and 209-S, non-staining dual-purpose oils primarily for medium duty to heavy duty operation on automatic screw machines. Form A-2723 covers Sunicut 102-S and 110-S, which contain active-type sulfur and are effective for heavy-duty operations. Sun Oil Co.

MECHANICAL POWER TRANSMISSION

274 **Variable Speed Control Simplified** — Bulletin 700 contains some 40 pp of descriptive application and engineering data on variable speed pulleys and selective speed transmissions. Illustrations show how old and new machines can be equipped with efficient speed control. Lovejoy Flexible Coupling Co.

275 **Improved V-Belts**—This literature on company's Vulco rope drives explains how this rope with concave sides is designed to fill out to a precise fit in the sheave groove, to provide less wear, more pulley contact and more sure power when needed. The Gates Rubber Co.

276 **Power Drive Handbook**—Catalog 709, describing roller chains and sprockets, includes tips on selecting stock roller chains for every type of power drive service. Diamond Chain Co., Inc.

277 **Belts to Suit the Job**—This bulletin presents company's "inner-locked" woven duck belting available in types for general elevating and conveying and general power transmission applications as well as special jobs. Imperial Belting Co.

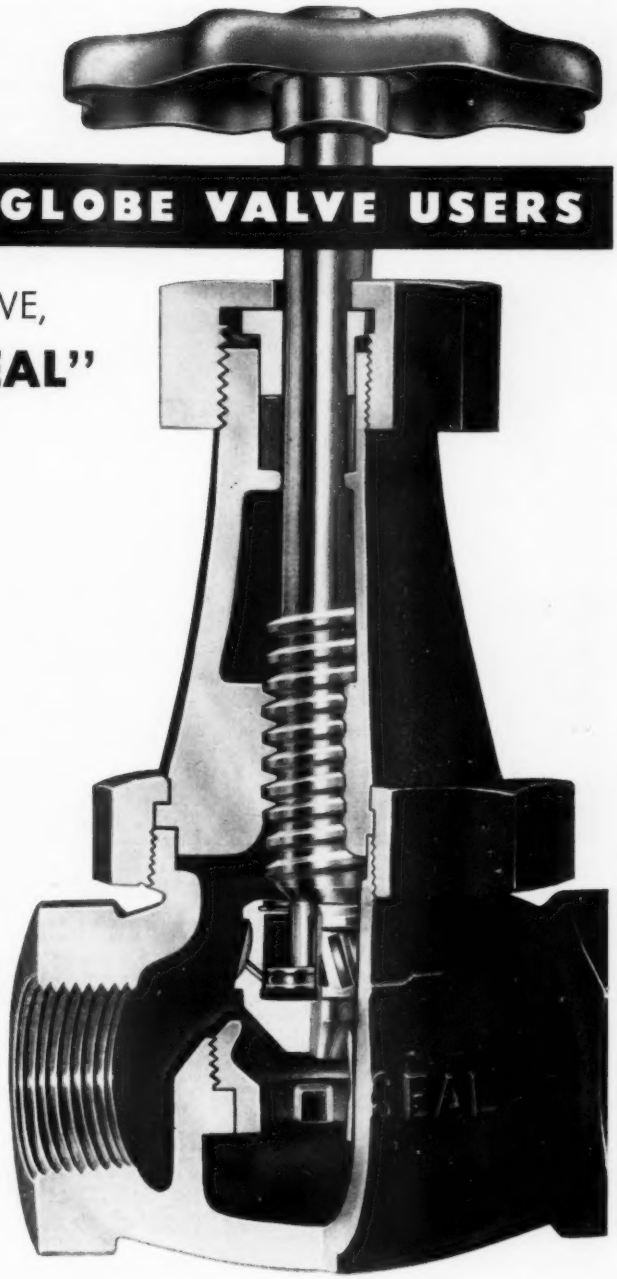
278 **Flexible Couplings** — Condensed Engineering Catalog 51-A contains excellent data on the choice and use of company's flexible metal couplings. Tells advantages of these couplings and discusses design principles. Double-flexing and floating shaft types, light duty couplings and types for special applications are described and pictured in detail, along with dimensional data. Includes standards for bore specifications. Thomas Flexible Coupling Co.

279 **Adjustable V-Belt**—This 8-pp catalog covers company's new Veelos TD and TE v-belt designed to reduce installation and operation costs on big drives. Studs, cup-washers and T-screws of the belt are illustrated, and installation and operation characteristics explained. Booklet includes directions on how to measure, to couple and uncouple, and to install. A table shows correct lengths for these belts. Manheim Mfg. & Belting Co.

280 **Coupling or Converter**—To promote a better understanding of hydraulic couplings and torque converters, this 32-pp publication tells where couplings or torque converters

GOOD NEWS FOR GLOBE VALVE USERS

THE FAMOUS OSTLIND VALVE,
NOW CALLED **"GYROSEAL"**
IS BACK! . . . . . .



Thousands of satisfied users report their original Ostlind Valves still on the line after years of exceptional service. Still no leaking, no freezing. Costly repairs and down-time greatly reduced.

GYROSEAL Valves retain the exclusive patented features. The disc revolves freely on long-lasting carbon bearings, keeping particles in suspension while the disc gently laps the seat for perfect closure. Upon opening, the disc again revolves casting off accumulated solids to keep the closure area clean.

The disc continues to revolve until the cracking or throttling position is reached. There, the disc stops revolving and the valve can be left in cracked or throttling position indefinitely. Note the increased area passage at the closure seat and reduced area at the throttling seat. Abrasive particles, bombarded by high pressure, cannot scour the closure area.

Materials now used in GYROSEAL Valves assure trouble-free use not only in steam lines but also where the most corrosive fluids are involved.

WRITE FOR FULLY DESCRIPTIVE BROCHURE

THE RICHMOND FOUNDRY & MANUFACTURING COMPANY, INC.

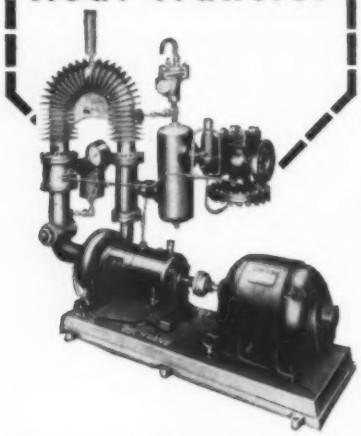
Department A, Richmond 20, Virginia

GYRO VALVE SEAL

Exclusive Producers of the **GYROSEAL** *Valve*
Production quantities available in 1" size only

For more facts circle 645 on Reply Card

A *REVOLUTION* in Increased Heat Transfer



Cochrane

C-B System removes condensate, air and non-condensible gases from processing equipment (any condensing medium) with

JET SPEED!

Assures optimum efficiency of process equipment by providing:

- *FASTER HEAT*
- *HIGHER TEMPERATURES*
- *MORE UNIFORM HEAT*
- *LOWER MAINTENANCE*

Faster, more uniform heat transfer from equipment results in:

HIGHER PRODUCTION—speeds start up time; shortens cooking, heating, drying cycles.

IMPROVED QUALITY—uniform heating—levels out fluctuations; eliminates cold spots.

FUEL SAVINGS—condensate returned to boilers without appreciable pressure or temperature drop. Fuel savings range as high as 20%. Make up water sharply reduced.

Use coupon for complete details.

Cochrane
CORPORATION
3126 N. 17th St. Philadelphia 32, Pa.
C100.4

COCHRANE CORPORATION
3126 N. 17th St., Phila. 32, Pa.

Send me Publication No. 3250 on C-B Condensate Drainage Control System.

Name_____ Title_____

Firm_____

Address_____

City_____ State_____

For more facts circle 646 on Reply Card

DATA FILE

(Begins on page 221)

should be used, and why, furnishing a source of facts on non-technical terminology. Covers meaning and characteristics of torque and effect on driving and driven equipment. Twin Disc Clutch Co.

281 **Spherical Roller Bearing**—A new roller bearing, designed for long service and increased capacity, easy installation and self-alignment, is described in this bulletin. Includes sizes available, also data on increased life capacity expected. SKF Industries, Inc.

282 **Transmission, Control Equipment**—Variable speed transmission and speed control devices are presented in 48-pp Catalog 45. Fully illustrated, provides descriptive and application information, operating principles, dimensional tables. More than 60 photos show use of this power transmission equipment in paper mills, food processing plants, textile plants, automotive plants, power plants, others. Lewellen Mfg. Co.

BOILERS, GENERATORS

283 **Boiler Reference Guide**—General Catalog 80. 32 pp, contains latest and most complete data on manufacturer's line of high and low pressure steel boilers for heating, power and process steam. Also includes descriptions of water heating products, both direct fired and storage types, as well as indirect water heating coils. Information on boiler support brackets, structural steel suspension and induced draft fans are also provided in this technical manual. Kewanee-Ross Corp.

284 **Oil or Gas Fired Automatic Boilers**—Boiler, burner, controls and safety features of 10 to 500 hp oil or gas fired automatic boilers are described in this 4-pp bulletin. Firing rates, dimensions and capacities are given for all models. Boiler Engineering & Supply Co., Inc.

285 **Packaged Boilers**—This 16-pp illustrated catalog describes manufacturer's new Type VP package boiler. Following a section of background information is an outline of principal design features of these boilers, which are shop assembled and provide steam capacities from 4000 to 30,000 lb per hour. Space requirements are shown in a table along with specifications. Combustion Engineering, Inc.

286 **Water Tube-Steam Generator—Bulletin** SB-51, 16 pp, discusses features of Keystone two-drum water tube steam generator for delivery of low cost steam. Cites advantages of conservative boiler rating (full five sq ft of heating surface for each developed horsepower), automatic controls, easy installation, fast steaming qualities, compact size. Gives specifications on all materials furnished, includes accessories. Erie City Iron Works.

287 **How Much for Steam**—This is a "slide rule" calculator for computing steam costs. It's pocket-sized, and enables a plant engineer to find comparative steam costs per 1000 lb. using coal, oil or gas, and based on fuel costs of price per ton, gallon, cubic foot. Cleaver-Brooks Co.

288 **Package Boilers**—This illustrated bulletin describes and lists manufacturer's line of water tube package boilers in 12 sizes from 6,000 to 39,000 lb of steam per hour and for pressures to as high as 900 psig. Contains full information on dimensions and weights. Stresses high operating efficiency with oil, gas or combination firing. Springfield Boiler Co.

289 **Steam Generators**—Data and specifications for completely plant assembled water-tube steam generators are contained in this 8-pp bulletin. They cover nine sizes from 5,300 to 33,000 lb steam per hour and for pressures up to 400 psi. These units are designed for fully automatic firing with oil, gas or stoker-fired coal. Superior Combustion Industries, Inc.

290 **Improved Steam Generator**—Bulletin 2000, 28 pp, explains advance design features that distinguish this manufacturer's generator from other unit steam generators. Describes and illustrates engineering differences of component features. Also shows how these components are constructed, assembled and tested. Another section gives data and dimensions and standard and accessory equipment for the

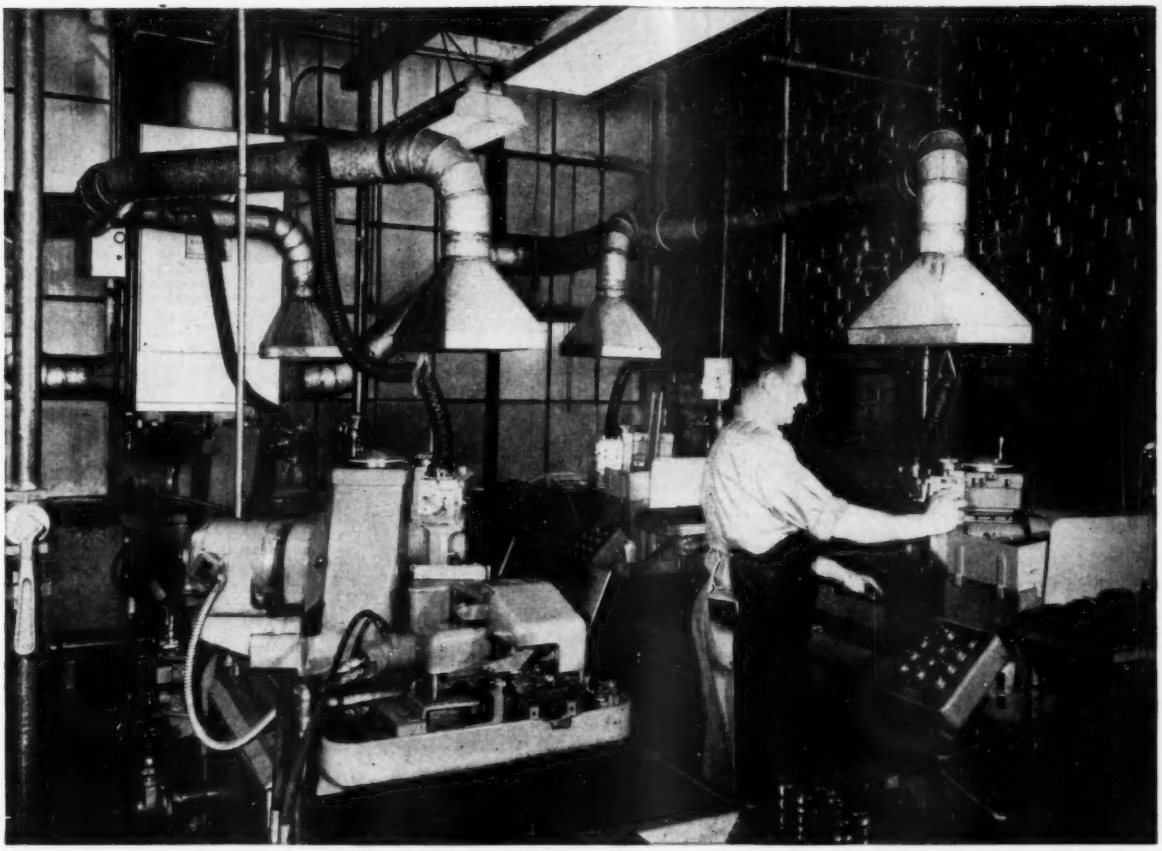
But why MEN over 45?

Our doctors still don't know *why*, but if you are a man over 45 you are six times as likely to develop lung cancer as a man of your age twenty years ago. They *do* know, however, that their chances of saving your life could be about *ten times* greater if they could only detect cancer long before you yourself notice any symptom. (Only 1 in every 20 lung cancers is being cured today, largely because most cases progress too far before detected.)

That's why we urge that you make a habit of having your chest X-rayed every six months, no matter how well you may *feel*. The alarming increase of lung cancer in men over 45 more than justifies such precautions. Far too many men die *needlessly!*

Our new film "The Warning Shadow" will tell you what every man should know about lung cancer. To find where and when you can see this film, and to get life-saving facts about other forms of cancer, phone the American Cancer Society office nearest you or simply write to "Cancer"—in care of your local Post Office.

American Cancer Society



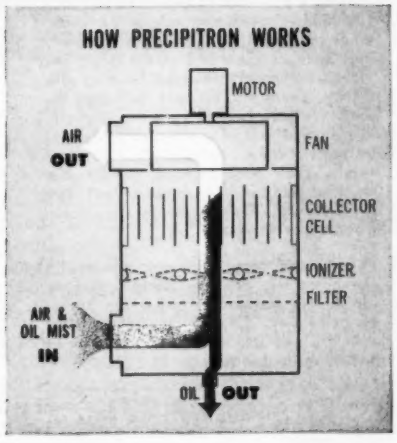
This view shows a PO-12 oil mist control unit and duct for flute-grinding machines.

WESTINGHOUSE PRECIPITRON ELIMINATES COSTLY AND DANGEROUS OIL MIST

Operating at full tilt, scores of thread-grinding and drill-fluting machines created an oil mist problem at Greenfield Tap & Die.

To overcome this situation, Greenfield installed several oil mist control units, incorporating a PRECIPITRON with a Westinghouse non-overloading fan. Now, oil mist and smoke are removed from the air and collected on the plates of the Precipitron by electrostatic action. Clean, mist-free, filtered air flows back into the shop . . . working conditions have been improved 100%—employee discomfort eliminated—and management satisfaction is complete.

If you have an oil mist problem, get in touch with your Westinghouse-Sturtevant sales engineer today. He has a full knowledge of the application of air handling and air cleaning apparatus to meet your requirements. Call your local Westinghouse office or write Westinghouse Electric Corporation, Sturtevant Division, Boston 36, Massachusetts.

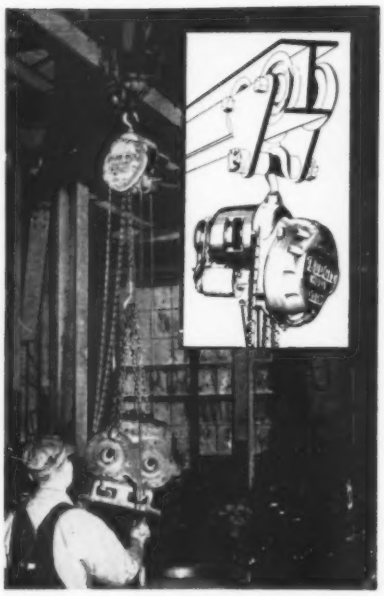


Oil-laden air passes through filter which strains out chips and abrasive particles . . . ionizer electrically charges each oil mist particle . . . then collector cell attracts and separates oil and smoke from the air stream. Clean air continues on through. Oil forms into droplets on collector cell plates and falls to the sump for re-use.

WESTINGHOUSE AIR HANDLING

YOU CAN BE SURE...IF IT'S Westinghouse

For more facts circle 648 on Reply Card



ACTS FAST
TO ECONOMIZE

The economy of the 'Budgit' Electric Hoist is many sided. Hoisting is fast, effortless. A slight pull on the control cord of the ¼-ton 'Budgit' lifts the full load a foot in less than two seconds.

The 'Budgit' consumes only a few cents' worth of current a day. Anti-friction bearings and precision spur gears assure the utmost in smooth, powerful hoisting efficiency. Every moving part, including the shafts, is heat treated for extra strength. The automatic load and motor brakes act instantly. Either brake holds the load safely. From hook to hook, quality construction and safety features protect man, load, hoist. 'Budgit' Hoists give long, trouble-free service.

Put new economy into production with the complete, portable 'Budgit' Electric Hoist. No installation costs. No accessories to buy. Capacities: 250 to 4,000 lbs. AC and DC models. Prices start at $139. Write for Bulletin 391.

'BUDGIT' CORD REELS increase the operating range of any make electric hoist, portable tool or mobile device with a motor up to 1 HP. Cable reels off in all directions.

MAXWELL MMM MANNING, MAXWELL & MOORE

'Budgit' ®

ELECTRIC HOISTS

MANNING, MAXWELL & MOORE, INC.
MUSKEGON, MICHIGAN

Builders of "Shaw-Box" and 'Load Lifter' Cranes, 'Budgit' and 'Load Lifter' Hoists and other lifting specialties. Makers of 'Ashcroft' Gauges, 'Hancock' Valves, 'Consolidated' Safety and Relief Valves, 'American' and 'American-Microsen' Industrial Instruments, and Aircraft Products.

For more facts circle 649 on Reply Card

DATA FILE

(Begins on page 221)

units which range from 20 to 6000 hp, for pressures to 250 psi. Preferred Utilities Mfg. Corp.

WATER TREATING

291 Boiler Scale — Formation and Prevention—Technical Paper 98 is a 12-pp article covering the cause and prevention of boiler scale. Covers the mechanism of scale formation, effect of boiler scale, chemistry of scale formation, internal chemical treatment and chemical correctives. Diagrams of feeder systems, photos and solubility charts in illustrated text. W. H. & L. D. Betz.

292 Information on Ion Exchangers—Here are three booklets on ion exchangers: Nalcite HCR, a styrene type cation exchanger; Nalcite SAR, a basic anion type; and Super Nalcolite, a synthetic gel type zeolite for cation exchange. Tables and graphs explain performance of these water treating resins under various operating conditions. Physical characteristics, exchange capacities, regeneration techniques discussed. Bulletin 57, 20 pp, is on Nalcite SAR; Bulletin 58, 28 pp, Nalcite HCR; Bulletin 59, Super Nalcolite. National Aluminate Corp.

293 Anti-Foam Treatment—Bulletin 5008-B explains how company's Formula 659, a polyamide anti-foam treatment for boiler and feedwater, acts to condition sludge, improve steam quality, reduce blowdown loss and prevent pitting. Gives tips on application of this powder (also available in briquette form) and dosages. Dearborn Chemical Co.

MAINTENANCE

294 Basic Roofing Information—"What You Should Know About Your Roof" is a 40-pp, clearly illustrated booklet which tells what makes a roof fail, how to recognize signs of roof deterioration, what to do to keep a roof in good condition. Discusses recommended roofing practices, essentials of a good re-roofing job, also special features of company's roofing materials. Johns-Manville.

295 Tar Base Coatings—Now available is a collection of five bulletins on company's 100 series of cold applied tar base coatings. One bulletin gives general information on the full line and provides an application chart. The others give detailed specifications and application information on the various types. These include a coating for protection against severest corrosive conditions; a thin high gloss coating for general maintaining purposes; a coating for protection against generally severe corrosive conditions; and one for water tank interiors. Pittsburgh Coke & Chemical Co.

296 Protective Paints—Details on a rubber-base paint formulated to afford increased protection against corrosion from acids and alkalis, and especially applicable for use on concrete, are provided in this literature. These finishes are also suggested for wood and metal surfaces. Cellulose Products Dept., Hercules Powder Co.

297 Blower-Suction Cleaner — Data on a portable combination blower-suction cleaner for cleaning machinery, motors, stock bins are offered. Describes models available, attachments for a wide range of cleaning jobs. Clements Mfg. Co.

298 Building Maintenance — Handbook 7 offers 64 pp of information on floor surfacing, leak stoppers, external wall sealants, road patching, roofing materials. Includes instructions for use. Flexrock Co.

299 Corrosion Protection Data — A detailed study of the performance of various protective coating systems, this bulletin gives test data on 11 coating systems exposed up to 83 weeks in hydrochloric acid atmosphere. Illustrated with photos, includes corrosion-failure time comparison chart. Gates Engineering Co.

300 Coatings for Chemical Industry — Advantages and use of synthetic resin-base coatings in the chemical industry are described in this 8-pp brochure. Presents 16 industrial case histories. Specific applications of coatings based on Bakelite and Vinylite resins described include tank cars, oil pipe, acid tanks, sewage disposal plant, shipping containers, plating rack and steel tubing. Also included is tabulation of effects of various chemicals on vinyl resin-base coatings. Bakelite Co., Div., Union Carbide and Carbon Corp.

301 Proper Care of Floors—Filled with what-to-use and how-to-use-it information, this 32-pp booklet is a well written, practical text on floors. Presents floor preservation as a triple process involving cleaning, sealing and maintaining. Discusses various floor surfaces and their special problems. Gives helpful hints on floor maintenance and provides a handy chart covering preparation procedures and products for 12 common floor surfaces including cement, wood, tile, linoleum, mastic wood. West Disinfecting Co.

302 Floor Scarifier—Bulletin 83.4 describes and pictures a new hydraulically equipped machine designed for removal of traffic-packed grimes from trucking aisles in industrial plants. Explains how it cuts, picks up grime in one operation. G. H. Tennant Co.

303 Vacuum Cleaning Equipment—Vacuum cleaning units to suit requirements for commercial buildings, industrial plants and buildings where noise is objectionable are listed in illustrated Bulletin 152. Also shown are furnace cleaners, units for emptying sump tanks, belt-drive units and special units. The Spencer Turbine Co.

304 Combination Scrubber-Vacuum — A single unit that applies the cleanser, scrubs, and picks up—all in one operation—is described in this illustrated literature. Gives full specifications for company's Model 213P, for large area floors and gives various methods of combination-machine-scrubbing suggested for hard, soft, oily floors. Also covers units for smaller and larger operations in gasoline-powered as well as electric models. Finnell System, Inc.

305 How to Paint a Fence—The use of this company's FencPainteR equipment for efficient and economical painting of fences is shown in this 32-pp brochure. Covers painting of wire, bar, board, picket and other fences, also masonry and brick walls, galvanized stucco and frame buildings. Gives ordering data on applicators, paint receptacles and kits, enamel, also special equipment and painting accessories. Fence Painter Corp.

CONSTRUCTION

306 Heat Absorbing Glass—This 16-pp catalog describes Coolite, a glass designed to trap and absorb much of the sun's heat and to filter out annoying glare. Discusses types and thicknesses, gives light transmission data. Pictures many industrial installations and shows how conditioned natural illumination helps reduce operating costs. Mississippi Glass Co.

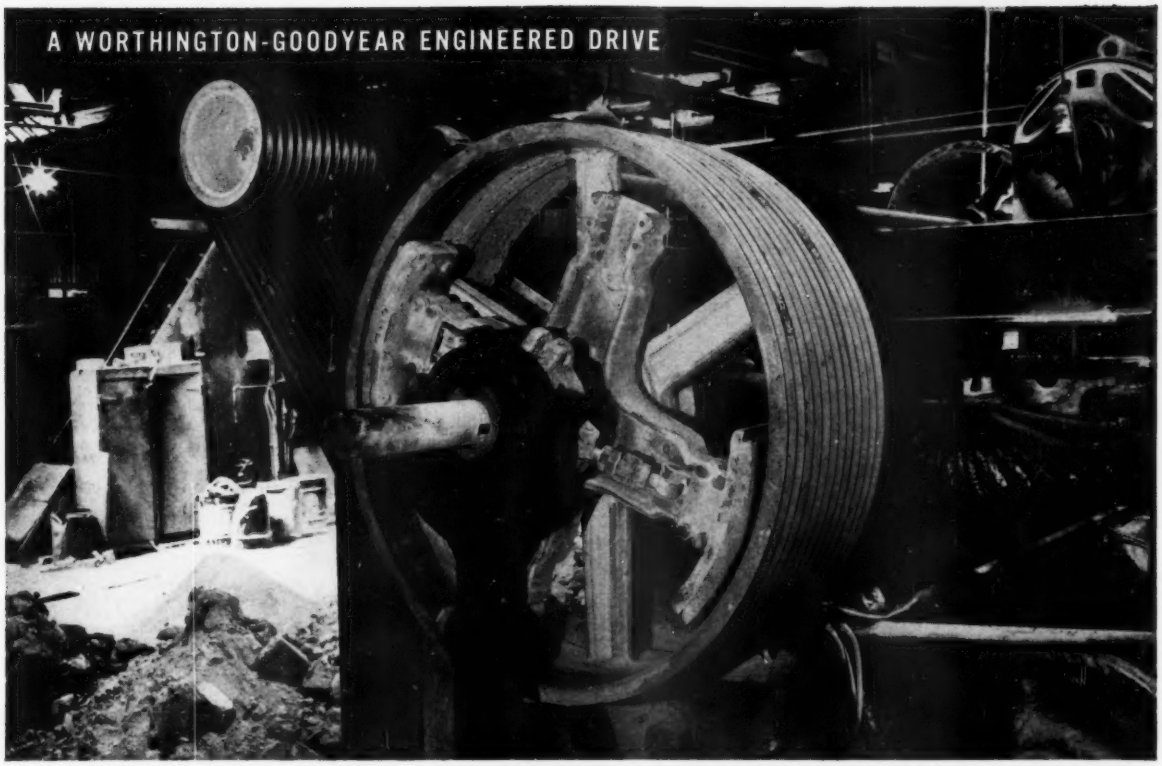
307 Non-Slip Flooring—Algrip, an abrasive rolled steel floor plate described as non-slip even on steep inclines, is the subject of Booklet A-5, 8 pp. Discusses safety features; gives fabricating data, dimensions, and allowable loads. Alan Wood Steel Co.

GAGE GLASSES AND
HIGH PRESSURE RUBBER GASKETS
ALL SIZES TO FIT YOUR GAGES

ERNST WATER COLUMN & GAGE CO.
Send for Catalog LIVINGSTON, N. J.

PROFESSIONAL SERVICES

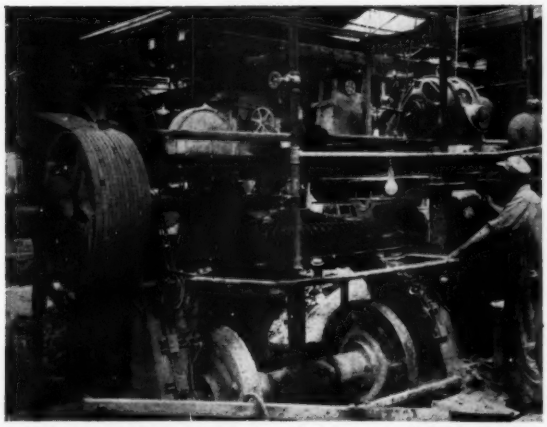
J. E. SIRRINE COMPANY
Engineers
Design and Supervision of Steam and Hydro-electric Power Plants, Industrial Plants, Mechanical and Operating Surveys, Appraisals • Plans • Reports
Greenville, South Carolina



WORTHINGTON MULTI-V-DRIVE takes heavy shock loads at R. C. Remmey & Son.

Belts hold as machine crushes 120-lb lumps

Worthington distributor solves critical drive problem for refractory



SMOOTH, NON-SLIP DRIVE for this wet-pan is provided by Worthington QD sheaves and Goodyear V-belts.

Driving a machine that crushes, mixes and tempers crude clay is a real workout for any mechanical power transmission setup — especially with lumps weighing as much as 120 pounds.

That's just what the R. C. Remmey & Son Company, Philadelphia manufacturers of refractories, ran up against in driving their 20-hp wet-pans.

About two years ago, R. C. Remmey & Son started looking for a replacement drive for one of these wet-pans. They contacted the nearest Worthington distributor who recommended Worthington QD* sheaves and Goodyear open-end V-belts.

Now, after two solid years of operation *not one belt has been replaced or tightened.* There's no noise, no slippage of belts on sheaves, and no power loss — which means maximum production. Because of this fine record, R. C. Remmey & Son is planning to install Worthington Multi-V-Drives on other wet-pan pulverizers.

Find out how this Worthington-Goodyear drive team can pay off for you, too. Write us. Worthington Corporation, Section MV.4.2, Oil City, Pa. **Reg. U.S. Pat. Off.*

MV.4.2

WORTHINGTON

BUY THESE WORTHINGTON STANDARD PRODUCTS FROM YOUR LOCAL DISTRIBUTOR

Compressors • Pumps • Multi-V-Drives • Variable Speed Drives

For more facts circle 651 on Reply Card

YOUNG HEAT EXCHANGERS

Provide Maximum Heat Transfer at Minimum Cost

- Efficient
- Lightweight
- Compact
- Rugged

Design Features

1. Smooth inlet and outlet flow bonnet.
2. Light and strong die-formed header.
3. Engineered baffle-spacing.
4. Precision parts prevent by-passing.
5. Non-ferrous shell and tube bundle.
6. For vertical or horizontal mounting.

Young Heat Exchangers provide maximum heat transfer at minimum cost. They are designed for any kind of fluid to fluid cooling for a variety of chemical and process applications under maximum operating pressure of 75 psi and temperatures up to 300° F.

Manufactured in a complete range of sizes, single and multi-pass, fixed tube and removable tube bundle, the units are built of ferrous or non-ferrous metals. Write for Catalogs 1049 and 1149.

Distributors in all principal cities. Check classified listings in your phone book; if not listed contact Racine, Wisconsin, direct.

YOUNG RADIATOR CO.

Heat Transfer Products for Automotive and Industrial Applications. Heating, Cooling and Air Conditioning Products for Home and Industry.

Dept. 324-E • RACINE, WISCONSIN

Factories at Racine, Wis., and Mattoon, Ill.

For more facts circle 644 on Reply Card

For more facts circle 652 on Reply Card

DATA FILE

(Begins on page 221)

308 **Heavy-Duty Flooring**—An emery aggregate flooring for heavy duty use is discussed in 8-pp Bulletin 653. Gives test data on this flooring. Describes safety features, improved trucking, heat resistance and other advantages. Walter Maguire Co.

309 **Painting with Aluminum**—Again made available to plant engineers is Form AD-228, 32 pp, on the use of aluminum paint. Discusses advantages of aluminum paints, describes three basic types for non-absorbent surfaces for weather-exposed wood, and for heated surfaces and those not exposed to weather. Typical maintenance applications are covered in text and picture and practical suggestions for good results included. Use of aluminum paint on steel, galvanized metal, wood, masonry and other surfaces is detailed. Aluminum Company of America.

310 **How to Glaze with Plexiglas**—Sixteen-pp Booklet PL-23 gives detailed information on glazing industrial and other buildings with flat panels of the acrylic plastic Plexiglas. Written for plant engineers concerned with frequent breakage of windows or other glazing problems. Gives properties and behavior of this sheet. Plastic Dept., Rohm & Haas Co.

311 **Lowdown on Suspended Ceilings**—Twelve-pp Bulletin A-129 is a "tell-all" brochure on a radiant panel heating, cooling, and acoustic control ceiling. Tells how company's three-way functional (suspended) ceiling is easy to lay out and install, competitive in cost. Diagrams and charts accompany text, which includes a brief of 12 advantages of this ceiling. Also provides departmentalization of components, performance characteristics, design and layout procedures, installation short cuts. Burgess-Manning Co.

312 **Where to Use Your Stud Driver**—Twenty-pp pocket-size Form 955 describes and pictures applications of studs, using company's Model 450 stud driver. Provides some operating hints and safety precautions and covers use of studs through steel into concrete, wood into concrete, wood into steel and steel into steel, as well as their use for attachment of pre-drilled fixtures. Remington Arms Co., Inc.

MATERIALS HANDLING

313 **Data on Tramrail Equipment**—Twelve-pp Form 2008F is a well organized booklet on tramrail systems. Tells what an installation can do toward improving handling efficiency. Rail and arch design, switches, cranes and transfer bridges, carries, hoists, cranes, buckets, grabs are pictured. Cleveland Tramrail Div., The Cleveland Crane & Engineering Co.

314 **Engineered Monorail Applications**—A file of application literature is announced as the beginning of a new service offered potential users of monorail equipment. Includes a technical booklet on automatic dispatch systems and an equipment bulletin in addition to several case studies of installations. As they are completed new groups of case studies will be sent to holders of file. Available to qualified plant engineers. The American MonoRail Co.

Postage-free Reader Service Cards make it easy to order any of this literature. See pages 35-36 and 219-220.

315 **Conveying Systems**—How this manufacturer's conveying systems are being used in handling dry pulverized and granular materials is shown in illustrated Bulletin FK-26. 16 pp. Types of systems and component parts are described and many typical installations pictured. Fuller Co.

316 **Metal Conveyor Belts**—This 24-pp booklet is an illustrated guide to selection of metal conveyor belts. Presents both conventional and balanced spiral weave belts; covers raised edge and flight constructions, chain

Save Up to 80% on Fastening Costs with the REMINGTON STUD DRIVER

"Cuts my conduit anchoring cost by an average of 74%"—writes one electrician about his Remington Stud Driver, and it's a typical report. With a speed of up to 5 studs per minute, this powder-actuated tool is bringing new economy to the job . . . new opportunities for electrical contractors.

Many contractors say they can bid lower, get more jobs with the Remington Stud Driver. Others tell us that the tool's light weight—6 lbs.—makes overhead work a lot easier. All are agreed that you can't beat the Stud Driver for setting studs in concrete and steel.

What's your fastening job? Whether you're fastening eye bolts for stringing wires or conduit clips to concrete, you'll save money with the Remington Stud Driver. For further information on how this amazing tool can help solve your fastening problems, mail the coupon at right.

"If It's Remington—It's Right!"

Remington DUPONT

Listed & Approved by Underwriters' Laboratories, Inc.

QUESTIONS YOU ARE ASKING

QUESTION:

Where can I get information about the guards that many electrical contractors have been using for special applications?

ANSWER:

Just send the coupon below; we'll be glad to supply you with a description of all the guards and their uses.

MAIL THIS COUPON TODAY

Industrial Sales Division, Dept. PE-5
Remington Arms Company, Inc.
Bridgeport 2, Connecticut

Please send me *free* copies of the new booklet showing how I can cut my fastening costs.

*Name*_____

*Position*_____

*Firm*_____

*Address*_____

*City*_____ *State*_____

For more facts circle 655 on Reply Card

DATA FILE

(Begins on page 221)

edge construction, high temperature belts, wire conveyor aprons. Wickwire Spencer Steel Div., The Colorado Fuel & Iron Corp.

317 **Conveyor and Elevator Belting Tips**—This 32-pp manual on installation, maintenance and care of conveyor and elevator belting, uses photos and drawings to show ways to improve belt service and lengthen belt life. Includes a discussion of belt design, covers, reinforcements and grades. Repair methods, splicing, and fastening are also covered, and there's a table listing common conveyor belt maintenance problems with their causes and remedies. The B. F. Goodrich Co.

318 **Conveyor Belting**—Twelve types of conveyor belting, for standard, heavy duty and special applications, are described in this bulletin. Pictures the belting in use, and discusses in detail some of the impregnations, coatings. Main Belting Co.

319 **Oilless Bearings for Conveyors**—Technical Catalog 210, 20 pp, gives detailed information for specifying, installing and use of bearings for screw and roller conveyors, together with operating characteristics. The sectionalized catalog provides tabular data and dimensional drawings to facilitate identification of bearings for replacement. Arguto Oilless Bearing Co.

320 **Chain Hoists**—Catalog 61, 32 pp, covers a line of chain hoists, telling how to select and use them. Provides an illustrated comparison chart of hoist types, a selector table and discussion of factors to be considered in buying a hoist. Multiple gear chain hoists, screw gear chain hoists, differential chain hoists described separately. Reading Crane & Hoist Corp.

321 **Manual on Electric Hoists**—Catalog H-46, 40 pp, covers monorail and stationary hoists and car pulleys. Explains fundamental types of grabs, methods of hanging I-beams, types of hoist suspension, controls. American Engineering Co.

322 **Industrial Lifts**—This booklet presents a wide range of elevating equipment designed to step up efficiency and cut handling costs. Covers dock lifts, crossover bridges, sidewalk elevators, service lift. The Wayne Pump Co.

323 **Electric Hoist Manual**—Catalog 215-B offers 38 pp of engineering, application and ordering information on company's Load Lifter electric hoists. Presents hoists with hand operated trolleys and with power travel, hoists with lug suspension, hook suspension and push-type trolleys, and with hand-geared trolleys, hoists for low head. Manning, Maxwell & Moore, Inc.

324 **Overhead Cranes**—Sixteen-pp Bulletin U-200 presents underhung overhead cranes of the push type, hand geared type and motor driven type. Fully illustrated with photos of cranes and typical installations, book provides application suggestions and full dimensional data. Also covers track hangers, tracks and trolleys. Chicago Tramrail Corp.

325 **How to Operate a Crane**—Booklet 920 is a 48-pp generously illustrated instruction book on crane operation, helpful to both beginner and seasoned operator. It shows hand signals, defines crane and hoist terminology. Covering all phases of crane operation, it discusses in detail the coordination of crane motions, and includes safety rules and inspection, maintenance tips. Individual copies of this book are free to qualified plant engineers. The Electric Controller & Mfg. Co.

326 **Locomotive Cranes**—Catalog 84, 16 pp, stresses advantages of the torque control unit used in company's cranes, and features illustrations of the mechanism and converter unit. Describes in detail the sealed, anti-friction bearings, air controls, brake, limit switch and other components. Orton Crane & Shovel Co.

327 **Shovel and Loader**—Described in 12-pp Bulletin 1932 is a hydraulic crown and hoist shovel and loader incorporating mechanical features usually associated with big shovels. Illustrates, gives specifications, application information on both pneumatic traction and crawler traction models. Dempster Bros., Inc.

328 **Trolley Hoists**—Bulletin DH-269, 2 pp, describes and pictures ½ to 3 t capacity army-type trolley hoists, plain or geared, for use where a close headroom assembly is required. Gives dimensional and capacity data, prices. Wright Hoist Div., American Chain & Cable Co., Inc.

329 **Stand-Up Fork Lifts**—Complete specifications are available on stand-up fork lift trucks in 2000- and 3500-lb capacities. These trucks feature easy maneuverability and use of Lev-R-Matic drive. Lamson Mobilift Corp.

330 **Portable Hoists**—This bulletin describes a lightweight air hoist in 2000, 1000, 500 and 300-lb capacities. Gives specifications, dimensions. Keller Tool Co.

331 **Materials Handling Equipment**—Illustrated Catalog P602 is a 44-pp guidebook on materials handling equipment for industrial plants. Subjects covered include description and application data on company's gas and electric fork lift trucks, motorized hand trucks, hand lift trucks and hand and electric hoists. The Yale & Towne Mfg. Co.

332 **Industrial Logistics**—Form A-9516-4450 is a 12-pp booklet covering strategic handling of materials from raw state to distribution. Discusses master unit load and transportation cycle. Explains company's system of adapting all loads to four types of containers, assembling maximum numbers of these into master unit loads, and transporting them as single units. The Elwell-Parker Electric Co.

333 **Industrial Truck Reference Guide—Bulletin 300**, 44 pp, covers company's line of current model tractors, trailers, fork lift trucks, platform lift trucks and load-carrying trucks. Major categories are: the trackless-train system; the fork-truck pallet system; and the lift truck-skid system. Each category is preceded

CONSULT P&S FOR THE BEST

Materials HANDLING EQUIPMENT

CUSTOM BUILT TO MEET YOUR NEEDS

Item B-426 $67.20

STOCK CHECKER'S TRUCK

Designed to handle a large variety of items or parts. Three steel shelves with 1" flanges all around. Floor clearance 9½". Overall height to top shelf 42½", top of table 50". 44" long, 20" wide. All steel welded construction. Semi-crated approx. 190 lbs.

UTILITIES RACK on wheels

Item NS-415M $67.75 (Roller bearing, 6" x 2", all-metal wheels).

Item NS-415R $70.20 (Ball bearing, 8" x 1½", rubber-tired wheels).

MACHINE TENDER on wheels

Item NS-428R $26.10 (rubber-tired wh'ls)

Item NS-428M $24.10 (all-metal wh'ls)

Built of sheet steel and angle iron-welded construction—tubular handle—approx. weight 65 lbs. 30" by 16" x 32" high. Top deck 2" deep, lower one 3" turned edges all around.

Item NS-298 $51.15

HAND DUMP TRUCK

Reinforced heavy sheet steel, ½ cubic yard, capacity—two 8" semi-steel wheels and two 4" metal swivel casters. Wt. 125 lbs.

Item S-987 $115.50

Heavy Duty WAREHOUSE TRUCK

Use anywhere heavy loads are moved and rubber tired wheels are desired. 54" long, 28" wide, 42" high at handle. Top of platform 14" off floor. Welded construction. Heavy 3/16" plate. Two swivel wheels at handle end. Approx. wt. 300 lbs.

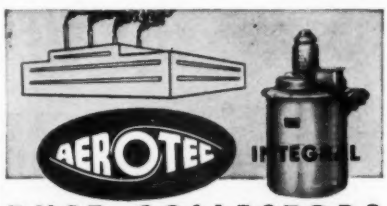
WHEN ORDERING always give "item" number. All PRICES are f.o.b. Detroit. Prices are subject to change without notice. Write for catalog.

DESIGNED AND MANUFACTURED BY

Palmer-Shile Co.

16023 Fullerton Ave. • Detroit 27, Mich.

For more facts circle 656 on Reply Card



DUST COLLECTORS

give you more positive industrial dust control!

The AEROTEC INTEGRAL is a highly efficient mechanical collector developed to give you the most effective industrial dust control! In many applications the high efficiency of the AEROTEC INTEGRAL permits the return of cleaned air to the room, appreciably reducing heat loss.

Only AEROTEC offers you high collecting efficiency over a wide range . . . constant pressure drop . . . no fire hazard since all materials used in construction are non-combustible . . . long life . . . self-cleaning collecting elements . . . easy maintenance—only periodic removal of dust from hopper or bin.

Why not let one of our representatives help you solve your dust-collection problems? Call or write him today!

Project Engineers

THE THERMIX CORPORATION

Greenwich, Conn.

(Offices in 38 Principal Cities)

Manufacturers

THE AEROTEC CORPORATION

Greenwich, Conn.

For more facts circle 657 on Reply Card

TAKE *Another* LOOK

at this

Conveyor Roll Bearing!

- **It never requires lubrication under any conditions.**
- **It operates as well indoors as out—under dry, dusty conditions, or where submerged or subjected to moisture.**
- **It resists abrasion—never sticks.**
- **It can be installed at low cost without special tools in a minute or two on all roller conveyors.**
- **It even operates well at minus 30°F.**
- **It will never drip and is non-contaminating.**
- **It is available for use with standard tubing with O.D. up to 4".**

IT'S AN *Arguto*

"NO MAINTENANCE"—NO REPLACEMENT OILLESS BEARING—

One of millions giving year-in, year-out service—many are specified on new roller conveyors; many are replacing high maintenance conventional bearings in old conveyors.

IMPROVE YOUR ROLLER CONVEYOR PERFORMANCE—SPECIFY OR INSTALL ARGUTO—IMMEDIATE DELIVERY

Write for Arguto Catalog No. 210 or send sample bearing or dimensions.

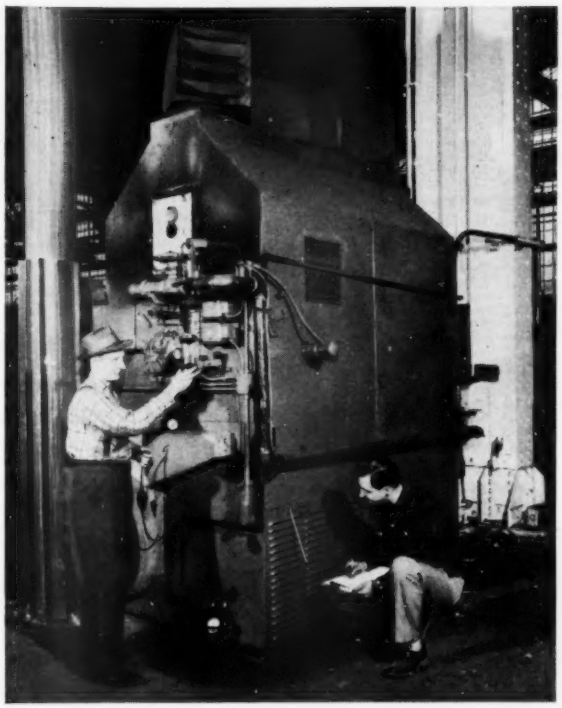
ARGUTO OILLESS BEARING COMPANY

147 W. BERKLEY STREET
PHILADELPHIA 44, PA.

20 years without a drink

For more facts circle 688 on Reply Card

another DRAVO HEATER *plus*



DRAVO Heaters give you 70% more life! . . . the "17-year test" proves it!

Most industrial warm-air space heaters have to be replaced after eight to ten years of service. Not so with Dravo Heaters!

Dravo's Research Department tested a *Counterflo* Heater to determine mechanical and physical endurance. This heater was operated on an accelerated schedule equal to 17 years. That's 70% *longer* than the average life of a comparable type warm-air space heater. Metallurgical inspection of the stainless steel combustion chamber showed no appreciable physical deterioration. Minute inspection of component parts showed only normal expected use.

You get this 70% *extra life* from Dravo Heaters because of their engineered design and construction. Dollar for dollar and year for year of operation, your best heating investment is Dravo Heaters.

Mail the coupon for complete information

DRAVO CORPORATION, Heating Department
Fifth and Liberty Avenues, Pittsburgh 22, Penna.

DRAVO

Please send me complete information about the Dravo:

☐ *Counterflo* Space Heater ☐ *Paraflo* Space Heater
☐ *Gas Fired* Unit Heater

☐ Please have a representative call at no obligation to me. Ask for Bulletin GH 598-68

Name _____ Title _____

Company _____

Address _____

City _____ Zone _____ State _____

For more facts circle 683 on Reply Card

DATA FILE

(Begins on page 221)

by an analysis of applications and merits of the handling system. Mercury Mfg. Co.

334 For "Floor Level" Handling — Junior Catalog 535 is the 100-pp eleventh edition of company's well known pocket-size catalog. Contains information, illustrations and specifications on fork trucks, high lift electric trucks, pallet trucks, industrial tractors, electric and hand lift trucks, Steeleg skids and boxes, semi-live skids and lifters, portable elevators and cranes, stacking frames, storage racks, die tables, and other handling specialties. Barrett-Cravens Co.

335 How to Pick a Truck — Catalog 54, 8 pp, features a step-by-step procedure for making the best fork truck choice for a particular handling job. Other sections in the booklet show at a glance complete specifications on each of company's trucks, and illustrate important construction and design features. The Baker-Raulang Co.

336 Railway Car Mover—"Reports from the Field on Trackmobile Savings and Advantages" tells how this small unit travels on road and track hauls and switches freight cars and requires only one operator. Stresses economy and easy handling. Whiting Corp.

337 Elevator Sills—This illustrated bulletin describes elevator sills which operate like a drawbridge. Features a model for mounting on the elevator itself which, when lowered, bridges gap between floor and elevator and, when upright, serves to keep trucks from rolling to elevator edge. Also describes a model for mounting to building floors, one designed for truck loading and other special models. Alexander Sill Co.

338 Truck Casters—Catalog S-53 is a 20-pp condensed ordering guide covering manufacturer's line of truck casters. Gives specifications, construction features and uses for each model shown. Presents rigid and swivel types for heavy-duty, medium- and light-duty applications, as well as "Floating-Hub" casters, and V-grooved wheel casters for track. Wheels and position locks are listed. The Bassick Co.

339 Trucks, Casters, Wheels—Catalog 50, 65 pp, covers platform trucks, superstructures, two-wheel and pry trucks, dollies, trailers, casters, wheels offering a wide range of chassis, superstructure and wheel combinations. Thomas Truck & Caster Co.

340 Portable Bar Racks — This catalog covers company's portable, heavy-duty bar racks for simplified handling and storage of steel shapes, and adapted to use with cranes or trucks. Palmer-Shile Co.

SAFETY AND SANITATION

341 Advice on Washrooms—Information on company's washroom advisory service is available to plant engineers. Tells of plans and specific suggestions for improving washrooms included in this service. Scott Paper Co.

"Burton and I would like to give notice, Boss, effective this minute."

342 Group Washing Equipment—Washfountains designed for modern group washing requirements for industrial plants, institutions, are shown in Bulletin D-766. Bradley Washfountain Co.

343 Dry Chemical Extinguishers — New quick-acting fire extinguishers of the dry chemical type in 20 and 30 lb sizes are covered in Form C-104. C-O-TWO Fire Equipment Co.

HEATING, COOLING

344 Forced Air Space Heaters—Illustrated Bulletin 523-B, 12 pp, is devoted to a line of forced air heaters for comfort heating, year-round ventilating, tempering make-up air, process drying and heat curing. Explains design efficiency, construction details, operating principles and flexibility of application. Advantages of the heater are detailed. Dravo Corp.

345 Utility Heaters—Fully illustrated, Catalog 6253 presents heaters for use in mobile units and small space heating requirements. Includes capacity and design information. Young Radiator Co.

346 Buying a Portable Heater? — Stressing safety factors involved, this 40-pp booklet, "Guide to the Selection and Use of Portable Space Heaters," analyzes temporary heating equipment from standpoints of personnel well-being, property protection and fire and accident prevention. Classifies basic types of direct-and indirect-fired portable heating devices, giving their advantages and limitations. Provides a guide for evaluating portable heaters in terms of design, construction, operation and safety. Herman Nelson Div., American Air Filter Co., Inc.

347 Preheating Combustion Air — How to reduce fuel consumption as much as 30 per cent by preheating combustion air for process equipment is told in this 12-pp bulletin. Discusses advantages of increased production, improved product quality, and reduced maintenance. Includes tables of operating data, photos and diagrams of typical installations and a chart for determining fuel savings afforded by preheating. Air Preheater Corp.

BARBER COLMAN

ELECTRONIC
Humidity Controls

For new or existing systems

- Installed in leading plants throughout the nation for humidifying or dehumidifying
- Extremely sensitive—no drift or shift in control point
- Plug-in type sensing element
- Available with or without aspirating fan
- Two-position or proportioning (modulating) types
- Full complement of associated controls—thermostats, humidistats, control motors, motor-operated valves, program switches.

- Housed in trim, modern steel cabinet, ready to install.

ASK for Bulletin No. F-5173 ...for complete specifications and application data.

Consult nearest Field Office or write:
BARBER-COLMAN COMPANY, ROCKFORD, ILLINOIS, U.S.A.
Dept. E, 1339 Rock Street • Field Offices in principal cities
Automatic Controls • Air Distribution Products • Industrial Instruments
Aircraft Controls • Small Motors • Overdoors and Operators • Molded Products • Metal Cutting Tools • Machine Tools • Textile Machinery

For more facts circle 660 on Reply Card

ARMSTRONG BROS.
Better PIPE TOOLS

Reversible Ratchet STOCKS and Adjustable DIES

Exceptionally convenient where space is limited, this stock simplifies pipe threading close to walls, in corners and whenever operating room is restricted. With *adjustable* dies (cut exact, over or under size threads) it is an ideal tool where valves and fittings are being installed or maintained.

"ARMSTRONG BROS." Adjustable dies are of special Vanadium Tool Steel, have "backed-off" teeth, correct cutting angle, ample chip clearance and correct throat angle. They start and cut easily, hold their sharpness and "spin" off pipe without jamming or tearing threads.

ARMSTRONG BROS. TOOL CO.
"The Tool Holder People"
5207 W ARMSTRONG AVENUE • CHICAGO 30, ILL.

For more facts circle 650 on Reply Card

protect your machinery with

maintenance free **LOVEJOY**

FLEXIBLE COUPLINGS

When you install Lovejoy Flexible Couplings you get more than just long-lasting smooth power transmission. You get maximum protection against surge, backlash and starting torque. You get reduced down-time and less maintenance, since cushions can be changed without shutdown and Lovejoy Flexible Couplings never require lubrication.

Accurately machined bodies and jaws and cushioning materials engineered to the load conditions are combined in a compactly designed coupling to keep your machinery running better . . . longer.

Types and sizes for all applications

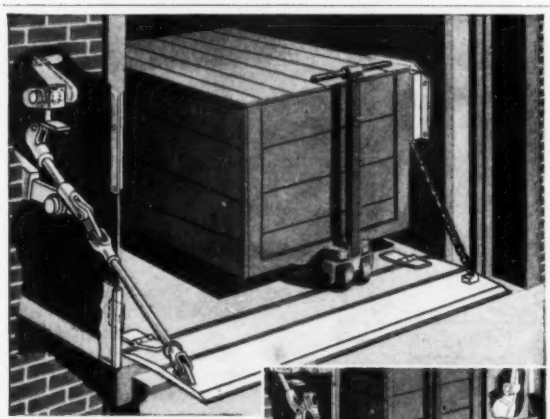
Send for complete catalog . . . contains full technical data and handy selector charts for your convenience. Yours without obligation.

LOVEJOY FLEXIBLE COUPLING CO.

4888 WEST LAKE ST. CHICAGO 44, ILL.

Also Mfrs. of Universal Joints, Variable Speed Pulleys and Transmissions

For more facts circle 661 on Reply Card



ALEXANDER ELEVATOR SILL

Bridges the gap between elevator and building floor. Becomes an integral part of the elevator and serves all floors, functioning like a drawbridge.

DOWN—it provides a smooth, safe trucking surface for trucks to roll on and off elevators. Protects elevators and doors, prevents damage to goods, minimizes accidents to personnel.

RAISED—it forms a guard, protecting doors against ramming by trucks.

Thoroughly tested and fully patented, the Alexander Sill is used by more than 5,000 satisfied customers.

Write for new catalog

ALEXANDER SILL COMPANY

Patentee and Exclusive Mfrs. of Elevator Sills since 1920

970 Milwaukee Ave. Dept. PE Chicago 22, Ill.

For more facts circle 662 on Reply Card

Waterless Gas Holder, Long Island Lighting Co., Garden City, N.Y.
Painting Contractor: Long Island Painting Co.
Aluminum Paint: Patterson-Sargent Co., New York and Cleveland

YOU, TOO, SHOULD PROTECT YOUR TANKS WITH ALUMINUM PAINT

Long Island Lighting has always used aluminum paint on this huge gas holder because aluminum paint covers well, gives a uniform, attractive coating so important on surfaces this large. Aluminum paint had served 7 years prior to repainting in November, 1952.

Long Island Lighting also uses aluminum paint on its propane tanks. They have found that aluminum paint's high reflectivity reduces pressure build-up caused by solar heat.

ALCOA does not make paint, but ALCOA Aluminum Pigments are used in more aluminum paints than any other brand. Special formulas have been developed by your paint manufacturer to solve individual problems. Paints made to these formulas actually cost you less, last longer, give utmost protection against heat, cold, sun, rain, smoke and fumes.

If *you* have a tank, smokestack, roof, boiler or other facility that needs the best protection, you should investigate aluminum paint. Write to ALCOA today for information.

FREE BOOKLET tells how to paint with aluminum.

ALCOA ALUMINUM

ALUMINUM COMPANY OF AMERICA

Aluminum Company of America, Paint Service Bureau
1790-E Alcoa Building, Pittsburgh 19, Pa.

Please send your free book, *Painting with Aluminum*. I plan to paint

_____

Name_____

Company_____

Address_____

City_____ Zone_____ State_____

For more facts circle 663 on Reply Card

DATA FILE

(Begins on page 221)

348 **Engineering Data for Heating Systems**—A great deal of helpful information on heating systems is presented in Engineering Data Manual 2695, 28 pp. Detailed illustrated information pertaining to heating problems is given. Besides covering heating terminology, there are sections on steam data, water properties, piping data, weights and measures and pipe dimensions. C. A Dunham Co.

349 **Radiant Heating, Cooling**—This interesting folder provides a discussion of radiant heating and cooling and the practical application of radiant energy heating to human comfort conditioning. Includes drawing and photo of a multi-purpose functional ceiling affording radiant heating, cooling and acoustical control. Burgess Manning Co.

350 **Industrial Dry Coolers**—Illustrated Bulletin DC-50, 12 pp, presents dry cooling equipment for small, "in-between," and heavy-duty cooling jobs and includes three recent models. Two are small "portable" units and the third a medium size unit. Although designed primarily for cooling engine jacket water, they can be used for cooling natural gas, lube oils, fluids of refining stages. The Marley Co., Inc.

351 **How Conditioning Units Can Help**—The advantages of self-contained units in cooling, dehumidifying, cleaning are cited in 40-pp Catalog 1307. Explains installation, operation. Provides data on direct expansion and cold water cooling, hot water steam heating. Clarage Fan Co.

INSULATION

352 **Insulating Material**—Ultrafine, a new thermal and acoustical insulation made of blown glass fibers, is the subject of this bulletin. Complete with photos of insulation in use and tables showing its efficiency, gives physical properties, principal uses, handling characteristics, thermal conductivity, and acoustical efficiency. Gustin-Bacon Mfg. Co.

353 **Pipe Insulation**—Bulletin F 1-100 features on-the-job installation photographs of cellular glass insulation for pipe temperatures between —300 and 800 F. Complete listing of physical properties and condensed recommended specifications made are provided. Pittsburgh Corning Corp.

354 **One-Coat Insulation**—This 32-pp booklet describes company's Type D insulation, a sprayed-on coating for surfaces with temperature range from —40 to 300 F. Tells how one application of this coating not only insulates but also waterproofs, rustproofs, deadens sound, prevents condensation and resists fire. Insul-Mastic Corp. of America.

You may use the two Reader Service Cards to request information on ads, too. Just circle the key number appearing at bottom of the ad.

355 **Improved Heat Insulation**—This 8-pp bulletin describes Super-Light 85% Magnesia for temperatures to 600 F, available in cement, blocks, pipe sections. Twelve advantages of this lightweight insulation are detailed. Recommended thicknesses, physical characteristics, prices are given. Also included is information on combination coverings with Tempchek inner layer for temperatures from 550 to 1500 F. The Philip Carey Mfg. Co.

FANS, BLOWERS

356 **Industrial Exhaust Fan**—Housing design, wheel construction and standard arrangements of manufacturer's Type EX exhausters are discussed in illustrated Bulletin C-46EX. Provides capacity tables, dimensions and photos of standard and special fan. Bayley Blower Co.

357 **Fan Engineering Data**—Bulletin A-108, 166 pp, gives fan laws and formulas, terminology, and recommended velocities for exhaust hoods. Includes air pressure conversion table, charts on dust resistance, entrance losses and rectangular equivalent of round ducts. Discusses fan installation, maintenance and lubrication, also noise problems. Hartzell Propeller Fan Co.

358 **Vaneaxial Fans**—Bulletin J-611 is a 16-pp booklet presenting company's Axivane Series 1000 fans. Explains advantages afforded by adjustable blades for ventilating and other industrial applications. Fans in this line consist of 136 models from 18 to 84 in. dia, volumes to 150,000 cfm. Photos of typical installations included. Joy Mfg. Co.

DUST CONTROL

359 **Dust Control Technology**—Detailed selection, operation and maintenance data are contained in this 50-pp digest-size book, "Industrial Dust Control Through Exhaust Systems." Treats exhaust hoods, piping systems, dust collecting equipment, exhausters and drives. Lists the basic methods of dust control and analyzes elements of systems. Pangborn Corp.

360 **Improved Dust Filters**—Sixteen-pp Bulletin 528-R gives information on continuous-automatic dust filters that can be furnished or unhoused for use on pressure or vacuum. Explains principle of cleaning the filter cloth with high pressure reverse jet air, and tells where these filters are being used. Provides comparative test data on these and other type filters; discusses industrial dust control service offered and diagrams some installations. Self-adjusting blow rings furnished with these filters are described in detail. The Day Co.

361 **Manual of Exhaust Hood Design**—Bulletin 270-E1, 24 pp, features engineering data on dust control systems for the metal working industries. Illustrates and discusses the design of exhaust hoods for many operations

This WILSHIRE POWER SWEEPER SAVES $3800 PER YEAR— YEAR AFTER YEAR

Back in 1951, it required 3 regulars and 2 part time sweepers to keep this Packing Plant clean. Since then, 1 man with a WILSHIRE Power Sweeper cleans some 79,000 sq. ft. of warehouse several times a day, plus approximately 60,000 sq. ft. of yard area as well as 1,000 feet of street curb area... and he does it in 6 hours per day! The result is a cleaner plant at a saving of $3,800 per year...year after year.

Your profits for '54 will depend on savings you can effect in operations and maintenance. Put a WILSHIRE Power Sweeper to work for you and start saving now. Write for data on Wilshire money-saving performance, and the name of your nearest WILSHIRE Distributor.

WILSHIRE POWER SWEEPER COMPANY
526 W. CHEVY CHASE DRIVE • GLENDALE 4, CALIFORNIA
IN CANADA: PLANT MAINTENANCE EQUIPMENT CO.—VANCOUVER—TORONTO—MONTREAL

For more facts circle 664 on Reply Card

CAL-WIC WIRE CLOTH
In all Meshes, Weaves and Weights

Filtering, screening or grading—whatever your special job demands may be—Cal-Wic Wire Cloth is available in the right mesh, weave or weight to meet your requirements. Resistance to corrosion, abrasion and temperature extremes assured through the use of appropriate metals and alloys.

The long-wearing qualities of Cal-Wic Wire Cloth take on added importance during times like the present.

For additional information write or phone our nearest sales office.

THE COLORADO FUEL AND IRON CORP.—Denver, Colo.
PACIFIC COAST DIVISION — Oakland, Calif.
WICKWIRE SPENCER STEEL DIVISION—Clinton, Mass.

CAL-WIC
INDUSTRIAL SCREENS
THE COLORADO FUEL AND IRON CORPORATION
CFI

For more facts circle 665 on Reply Card

Viscous Materials

FLOW LIKE WATER

through

Parks-Cramer Jacketed Pipe and Fittings

You can't find a better way to convey asphalt, rosin, wax, sulphur, gums, syrups, or other high melting point solid or viscous materials than through Parks-Cramer Jacketed Lines.

Steam, hot water, hot oil, or Dowtherm keep the contents in a quick moving liquid state. Plug-ups are eliminated.

Jacketed Cocks and Fittings are cast in semi-steel, Ductile iron, Ni-Resist and many other materials.

Pipes and Fittings are made in standard sizes with 1¼", 1½", 2", 3", and 4" inside diameter, and include Two-way and Three-way Cocks, Tees, Crosses, 90° and 45° Elbows, and Expansion Joints and Strainers, also 2" and 3" Relief Valves.

Write for Bulletin No. 152P

Parks-Cramer Company

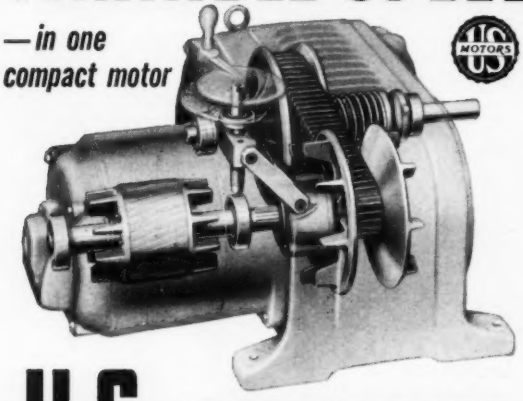
ENGINEERS and CONTRACTORS

Fitchburg, Massachusetts

For more facts circle 666 on Reply Card

Simplified VARIABLE SPEED

—in one compact motor



U.S. *VARIDRIVE*

...miracle motor with infinite speeds

Varidrive accomplishes in a single power unit functions that formerly required many separate cumbersome units. You can instantly vary speed for each load condition; increase production; improve operator's ability; adjust speed to overcome chatter, vibration and pulsation.

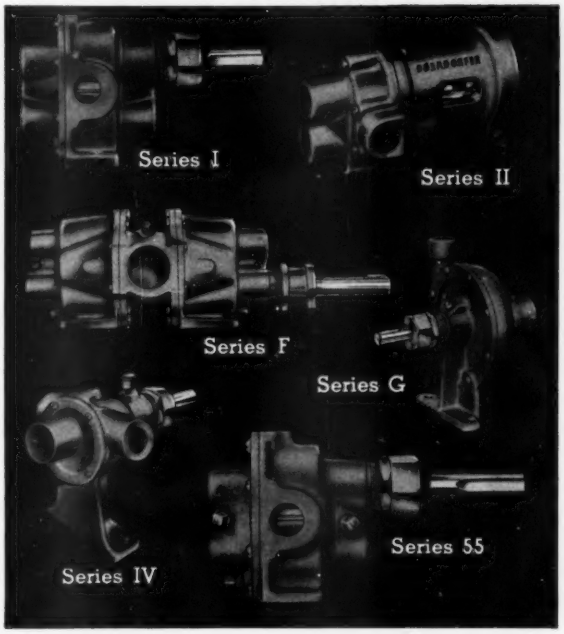
Write for new 16-page U. S. Varidrive Motor Bulletin.

U.S. ELECTRICAL MOTORS Inc.

Box 2058, Los Angeles 54, Calif. Milford, Conn.

For more facts circle 667 on Reply Card

You bought 40% more of them in the 1st quarter of 1954 than in the 1st quarter of 1953



Series I—Heavy duty bronze rotary gear pumps
Oilless bearings 2-23 G.P.M.—0-100 P.S.I.

Series II—Close coupled motor driven bronze pumps
Oilless bearings 2-4 G.P.M.—0-100 P.S.I.

Series F—High volume bronze rotary gear pumps
Oilless bearings 50-150 G.P.M.—0-150 P.S.I.

Series IV—Rubber impeller bronze pumps
Oilless bearings 6-21 G.P.M.—0-30 P.S.I.

Series 55—Standard bronze rotary gear pumps
Grease fittings 2-23 G.P.M.—0-100 P.S.I.

Series G—Standard bronze centrifugal pumps
Grease fittings 2-25 G.P.M.—2-10 P.S.I.

OBERDORFER BRONZE PUMPS

Industrial Pump Div., Oberdorfer Foundries, Inc.
1145 Thompson Rd., Syracuse, N. Y.

Address the 1954 edition of the Oberdorfer Industrial Pump catalog to:

NAME .....

COMPANY .....

ADDRESS .....

.....

Do you want a factory representative to call ☐ Yes ☐ No

For more facts circle 668 on Reply Card

DATA FILE

(Begins on page 221)

in this field. Also, 61 photos of dust control installations show various methods of hooding dust sources. American Air Filter Co., Inc.

362 Dust Control—"Engineered Efficiency in Dust Collection and Recovery," 36 pp, discusses industrial dust recovery from standpoint of nuisance abatement, waste avoidance, hazard elimination. Shows effect of variation in particle size distribution and specific gravity of dust on efficiency of the dust collecting system. Buell Engineering Co., Inc.

363 Dust Collectors — Operation, construction, versatility and maintenance of company's unit dust collectors are explained in this bulletin. Includes capacities, sizes. The Kirk & Blum Mfg. Co.

364 Dust and Fume Eliminators—Catalog 482, 12 pp, describes company's Centri-Merge dust and fume eliminators, explaining advantages of the swirl action incorporated. Illustrations include photos of installations, and dimensional drawings of units with capacities ranging from 400 cfm up to 5000 to 30,000 cfm. Schmieg Industries, Inc.

365 Dust and Fume Collector — Revised Bulletin 164-3 describes automatic bag type dust arresters, with illustrations of principal components and schematic diagram of typical installation. Capacities under 2 to 1 and 3 to 1 cfm ratios are quoted in table of arrester sizes and dimensions. Collecting efficiency and other advantages offered by cyclic cleaning are discussed. The Northern Blower Co.

HOSE AND TUBING

366 Metal Hose Manual—Technical Data Book U-111, 24 pp, includes information on application, temperature ranges of various types of metal and wire braided hose, dimensions, couplings, assemblies. Types of hose manufactured by this company are illustrated and described, including seamless all-metal flexible pressure hose; interlocked suction, blower and conveyor hose; square locked conduits and flexible spout tubing; double wire-braided hose. Universal Metal Hose Co.

367 Hose and Tubing—Catalog CC-400 is a 16-pp illustrated quick-reference booklet on manufacturer's flexible metal hose and tubing. These products are made in two basic types: seamless and strip wound. Catalog shows wide range of available alloys and sizes, suggested uses; gives engineering data. The American Brass Co.

METALS

368 Cold-Finished Steels — Ten grades of cold finished case-hardening Jalcase steels are discussed in Bulletin AD-6, 14 pp. Describes properties of this free-machining open hearth steel as easy machinability, minimum distortion, faster heat treatment, high wear resistance. Jones & Laughlin Steel Corp.

369 Stainless Steel Selector—Here's a slide-rule chart designed to answer questions on what type of stainless steel should be used for most operations. Chart gives a comparison of stainless physical and mechanical properties and high temperature properties. On its reverse side are given the important characteristics of stainless, including resistance to corrosion and to scaling, machinability, weldability and hardenability. Crucible Steel Co. of America.

VIBRATION CONTROL

370 Improved Machine Mounts — This brochure describes advantages of company's leveling machine mounts. Tells how they enable installation and leveling of heavy machines without bolting or shims, afford increased plant mobility, reduce maintenance costs, and lessen noise. Barry Corp.

371 Engineered Vibration Control—Bulletin 104 presents spring, cork and rubber mountings, discusses advantages of each and use alone or in combination. Provides helpful selection chart covering a wide range of machines, showing recommended and alternate methods of isolation. The Korfund Co.

OTHER EQUIPMENT

372 Industrial Ovens — Thirteen types of company's Convectioneered ovens, which apply principles of forced convection heating to various industrial processes, are illustrated and described in 12-pp Bulletin 200. These ovens serve foundries, metal finishers, plastics producers, rubber manufacturers. Component parts are discussed in detail. The W. W. Sly Mfg. Co.

373 To Keep Wire Rope at Work—Form 3547 is an 82-pp handbook titled "Here's How to Keep Your Wire Rope Working," and filled with practical tips on care and use of wire rope. Tells how wire rope is constructed, what types are suited to various jobs, how to install it. Covers such subjects as abrasion, lubrication, avoiding kinks, alignment of sheaves, winding on drums, bending fatigue, wire breaks, when to discard a wire rope. Wire Rope Div., American Chain & Cable Co., Inc.

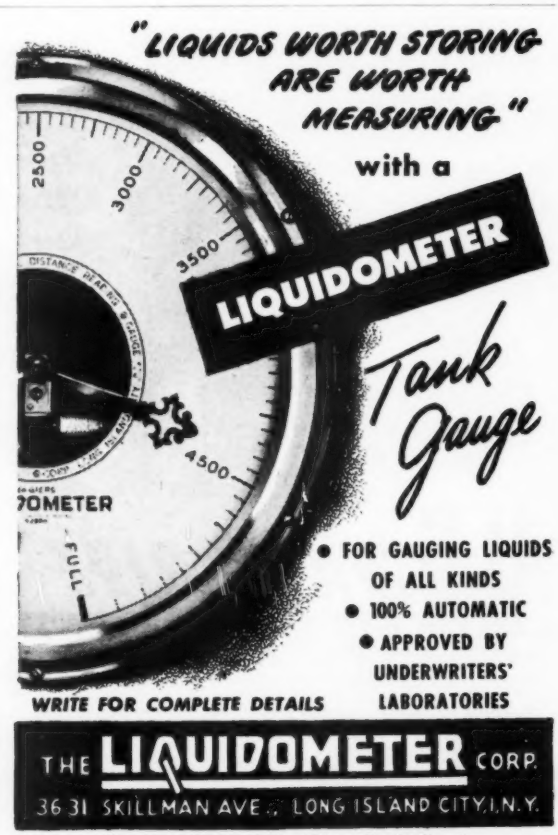
374 Air Line Cleaner—Eight-pp Catalog 252 describes manufacturer's Aridifier, a mechanical device for removing moisture, scale and other impurities from air or gas lines. Explains, illustrates operation, shows some typical applications and gives average cfm requirements. Tells how to select proper size unit, where and how to install it. Logan Engineering Co.

375 Industrial Equipment — Bulletin WP-1099-B61, 16 pp, describes manufacturer's industrial equipment including centrifugal refrigeration systems, condensers and coolers, steam power plant equipment, water conditioning deaerators and rotary pumps. Gives features, types, sizes, capacities, and describes their application. Worthington Corp.

376 Hints on Babbitting Practice—In outlining basic steps for the prevention of common bearing failures, Bulletin 146 a little 16-pp booklet, covers everything from the choice of

NEED WHEELS ?
See
THOMAS TRUCK
of Keokuk
Advanced designs for today's increased speeds and greater hauling distances. A complete selection of sizes, in all types of wheels to meet your exact requirements. Capacity rated to help you choose the right wheel for the job. All wheels equipped with Hyatt roller bearings having hardened outer races to insure longer years of service. When you need wheels—see THOMAS, first!
SEMI-STEEL
MOLDED-ON RUBBER TIRED
PNEUMATIC OR CUSHION
RESONITE
Send for Free Literature
THOMAS TRUCK AND CASTER COMPANY
485 Mississippi River
KEOKUK, IOWA

For more facts circle 669 on Reply Card



For more facts circle 670 on Reply Card

Piasecki tandem-rotored six-place craft with large rescue hatch. Its mission — search and rescue; utility transport.

SAVE YOURSELF
from costly, excessive wear

...with AMPCO* METAL

Aerial Life Guard — that's one of the key roles of the helicopter. Such an important role calls for extra dependability.

That's why Piasecki Helicopter Corp. uses Ampco Metal — uses it to withstand severe shock loads, high operating speeds and corrosive action of the elements — and to provide excellent bearing qualities.

Ampco Metal has other properties that appeal to designers and plant-operating men. It has high compressive strength — doesn't squash out... high resistance to corrosion, erosion, and abrasion... high impact and fatigue values.

If you have a wear problem in either product or plant, investigate the cost-saving properties of Ampco Metal. For further information consult your nearby Ampco field engineer or write us.

AMPCO METAL, INC.
Dept. PE-5, Milwaukee 46, Wisconsin

West Coast Plant, Burbank, California

*Reg U. S. Pat. Off.

D-128

For more facts circle 671 on Reply Card

● Beaver machines are made with lathe-like precision, yet are as rugged as power shovels. They can be depended upon to "deliver the goods" job after job . . no costly downtime for repairs or adjustments. When you buy a Beaver, you're assured of a quality product, manufactured by an experienced company. That's why we say . . . "Buy a Beaver and forget about it!"

WRITE FOR YOUR BEAVER QUICK-REFERENCE CATALOG NOW!

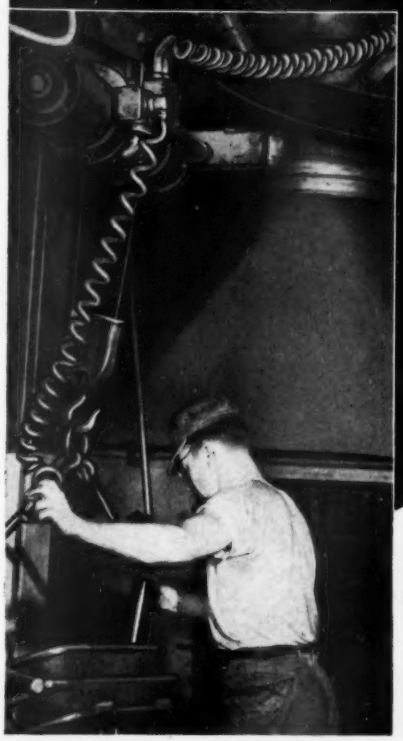
Check these amazing BEAVER Features! The BEAVER Model "A" Pipe and Bolt Machine

• Right-handed operation. • All controls in front. • Chuck to the left, tool mounting to the right. • All gears run in oil. • Inverted chip-free rack-and-pinion feed. • 12-inch working space. • Heavy-duty 1/8 to 2-inch chuck. • Ring-type adjustable quick-opening die heads—no hinge to get fouled with chips. • Power to thread up to 12-inch pipe. • 200 different kinds and sizes of dies available!

BEAVER PIPE TOOLS
210-300 Dana Ave., Warren O., U.S.A.
"53 Years of Highest Quality"

For more facts circle 672 on Reply Card

EXPERIENCE PROVES *Koiled Kords* are built for heavy duty service . . .



Photograph courtesy of International Harvester Company, Louisville, Kentucky.

FIVE YEARS of continuous service ON MONORAIL HOIST.

Foundries are tough on flexible cord. But in one foundry, built five years ago, where KOILED KORDS retractile cords were installed originally on all monorail hoists, cord maintenance trouble has been practically non-existant. Eighty to eighty-five per cent of the cords have been in continuous use for the entire five year period. KOILED KORDS retractile cords are specially constructed to withstand rugged industrial conditions. They endure repeated cycles of extension and retraction without failure. The neoprene jacket withstands oil, grease, chemical fumes and abrasion.

KOILED KORDS retractile cords are available in Type SV, SJO, and SO, Underwriters' approved. They extend to approximately five times their retracted length.

Write for booklet showing many applications.

KOILED KORDS is the Trademark of Koiled Kords, Inc.

© 1954

Koiled Kords Incorporated

BOX K, NEW HAVEN 14, CONN.
In Canada:
R.D. Fleck & Co., Ltd.,
Oshawa, Ontario

For more facts circle 673 on Reply Card

DATA FILE

(Begins on page 221)

metal for a particular bearing application through the correct pouring practice to in-service maintenance. Proper lubrication, a maintenance schedule, and operation at correct speed are discussed. Federated Metals Div., American Smelting and Refining Co.

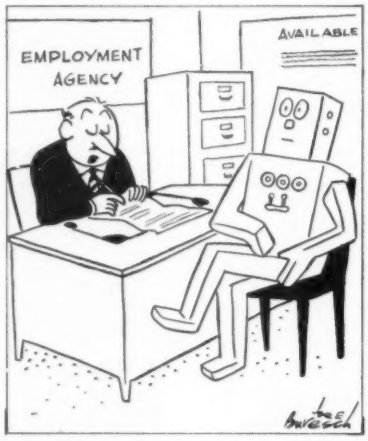
377 **Neoprene Design Book**—This illustrated bulletin discusses the properties of Neoprene, showing how they are utilized in products made from this chemical rubber. Covers its toughness, hardness range, air retention, performance under load, at extreme temperatures, flame and chemical resistance. Rubber Chemicals Div., E. I. du Pont de Nemours & Co.

378 **ABC's of Dryness**—Eight-pp Bulletin 16.0.081 presents packaged dehydration units for efficient drying of air or other gases. Tells what these dryers can do, what they will remove dryness from and where they are recommended for use. Explains drying operation; discusses adsorbents and equipment utilized, giving construction details and sizes offered. Typical arrangements for both full-stream and split-stream reactivation are diagrammed, and selection information included. Equipment Div., J. F. Pritchard & Co.

379 **Production Control System, Procedures**—Publication X-1268, 56 pp, details a method of material control intended to result in a shorter planning cycle while speeding production by eliminating causes of delay on the production lines. Illustrated with typical forms and charts, book outlines procedures for engineering, production planning and progress, machine load, material and tool procurement and control. Remington Rand Inc.

380 **Data for the Shop**—"Fluids and Facts for Metal Working," is a pocket-size booklet of about 44 pp. A section on metal working fluids covers their functions and selection, preparation and use of soluble oils and paste compounds, and prevention of dermatitis. A section on metal working facts gives conversion tables, steel numbering systems, machinability ratings of metals, drill grinding charts, twist drill sizes and other data. Booklet also includes product data on industrial oils, machine tool lubricants, greases, quenching and tempering oils and cutting fluids. Standard Oil Co. (Ind.)

381 **Guide to Rust Prevention**—The 24-pp 1954 edition of this company's general catalog provides a treatise on rust prevention. Features 94 color chips of manufacturer's products and includes instructions for surface preparation and application of primers, short- and long-oil types, machinery and implement finishes, chemical and heat resistant types, sealers, oil field finishes, thinning oils and floor and masonry coatings. Presents a restful color group of finishes for plant interiors; also describes special finishes. Rust-Oleum Corp.



"Electrically inclined, you say."

382 **High Pressure Cylinders**—Catalog 233A, 32 pp, covers cylinders for hydraulic operation, for working pressures to 1500 lb. Fifteen models are presented along with dimensions, capacity data, design details. Book also provides information on clevises and mounting brackets, air cylinders and valves. Includes alignment chart. Photos of models and dimensional drawings illustrate concise text. Hanna Engineering Works.

383 **Industrial Leathers**—These illustrated data sheets cover company's leather products and include specifications on various types of leather belting. Also gives data on leather packings for hydraulic and pneumatic equipment. J. E. Rhoads & Sons.

384 **Flux Recovery Equipment**—How company's flux recovery equipment salvages valuable flux, saves man-hours, and speeds and improves welding is told in this 6-pp illustrated bulletin. Describes primary separator and feed tank. Pictures some typical recovery installations, and provides size and capacity data for portable units as well as continuous automatic flow systems. Invincible Vacuum Cleaner and Mfg. Co.

385 **Plumbing, Heating Supplies**—Edition G is the current edition of this company's 118-pp general catalog on plumbing and heating repair parts, tools and accessories. Indexed and generously illustrated, gives sizes, intended uses and necessary ordering information. J. A. Sexauer Mfg. Co., Inc.

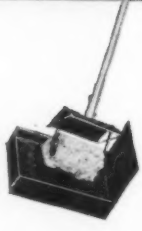
386 **Socket Head Fasteners**—Advantages of company's screw products are described in this folder. Included are socket head cap screws, shoulder screws, flat head socket cap screws and button head socket screws. Also described are socket screw keys, square head set screws, pressure plug and dowel pin. Standard Pressed Steel Co.

387 **Automatic Filters**—Twelve-pp Bulletin 500 describes and illustrates, company's Staynew automatic filters for large air volume and high efficiency. Bulletin contains specifications, engineering and performance data on filters in wide range of sizes for handling any desired air capacity. Dollinger Corp.

SAVE 50% and more in Labor - Material with FencPainteR

For WOOD - METAL BRICK - STONE CONCRETE

Hundreds of industries and institutions all over America are using the FencPainteR applicator system of painting at immense savings. It's five times faster than brushing methods. Irregular and corrugated surfaces painted with the same facility and covering power as smooth surfaces. One concern painted 6 ft. wire fence at a total cost of only 20c per lin. ft. FencPainteR enamels contain only top-notch ingredients — go much farther — are more economical in the long run.



SPECIAL TRIAL OFFER — Including industrial size FencPainteR and 5 gal. FencPainteR aluminum enamel, 1 gal. solvent. Complete, only $57.00. Enough to do 300 lin. ft. of 6 ft. chain link fence. (Add $5.00 for gray, white or black — $10.00 for red or green).

THE ONLY ROLLER MADE WITH CAPILLARY ATTRACTION (PAINT HOLDING POWER)

FencPainteR Corporation

2314 W. Van Buren Street Dept. PE Chicago 12, Ill.

MAIL COUPON for new 32 page illustrated brochure with full details covering FencPainteR products and their use.

FencPainteR Corp., 2314 W. Van Buren St., Dept. PE Chicago 12, Ill.
☐ Please rush Free 32 page Brochure
☐ Send Special Trial Offer, complete
(Color desired_____) $_____
Name _____
Address _____
City _____ State_____

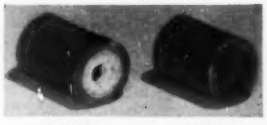
For more facts circle 674 on Reply Card

CALCI-SOLVE

quickly dissolves heavy deposits but

NEVER HARMS THE PIPE

CALCI-SOLVE instantly dissolves heavy layers of sodium, iron, rust, urinary salts, calcium, magnesium, concrete. The amazing development RD-188 prevents chemical action on pipes.



BEFORE AFTER

RD-188 forms a coating on the metal to protect it from harm. After CALCI-SOLVE has done its work RD-188 immediately HALTS action which might otherwise do damage to pipes.

MAKE THIS TEST

Drop a rusty nail in a jar containing strong acid and another in CALCI-SOLVE. Notice how CALCI-SOLVE eats away rust, then stops, while the other acid continues to eat the nail.

PROOF THAT CALCI-SOLVE IS HARMLESS TO PIPES

SEND TODAY . . .

For further information which tells why CALCI-SOLVE is best for cleaning boilers, submerged water heaters, steam lines, return water systems, excess cement from plumbing fixtures. Write:

Vince B. Nyhan Company, 1801 S. Jefferson St., Chicago 16, Ill.
Manufacturers of

CALCI-SOLVE

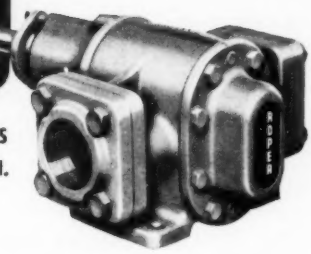
Available at Crane Co. branches

For more facts circle 675 on Reply Card

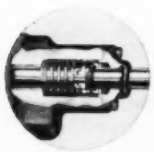
ROPER

SERIES K

FOR
HYDRAULICS
PRESSURE LUBRICATION
FUEL TRANSFER



¾ to 50 G.P.M. SIZES
Pressures to 150 P.S.I.



Mechanical Seal
Ideal where repacking is not convenient. Uses any drive; no pedestal bearing needed.

Extremely compact in all sizes . . . handle total suction lifts up to 25 feet . . . operate quietly and with equal efficiency in either direction. Sizes 10 through 50 feature Roper Venturi Suction and Discharge Principle. Packed box or mechanical seal models available . . . also furnished with or without relief valve.

Send for Catalog

GEO. D. ROPER CORP.
145 Blackhawk Park Ave.
Rockford, Illinois

ROPER Rotary Pumps

For more facts circle 676 on Reply Card

WRITE for this TECHNICAL DATA BOOK

UNIVERSAL METAL HOSE COMPANY
2119 South Kedzie Ave. • Chicago 23, Illinois
For more facts circle 677 on Reply Card

HERE'S WHY

DYNAPRENE® *Flexible Cord*

COSTS YOU LESS...

DYNAPRENE Flexible Cord is built to last under the most rugged shop conditions. Lower priced cord can be bought, but **DYNAPRENE** lasts so much longer that there are fewer replacements, a minimum of down time for tools and less labor lost . . . all of which adds up to economy.

HERE'S HOW DYNAPRENE IS BUILT

DYNAPRENE has flexible stranded copper conductors; separator over conductor to protect the insulation from corrosive effects of copper; high dielectric-strength rubber insulation; fillers for strength and roundness; textile covering for firmness and reinforcement; extra tough, long lasting, tire-tread type neoprene jacket with oil and sunlight resistance to withstand the most rugged working conditions. **DYNAPRENE** Flexible Cord is available in Underwriters' type SO, SJO and SV-neoprene jacketed.

For long life and true economy be sure you get **DYNAPRENE** Flexible Cord.

WELL BUILT WIRES SINCE 1899

WHITNEY BLAKE CO.

NEW HAVEN 14, CONNECTICUT

For more facts circle 678 on Reply Card

INDUSTRIAL FILMS

On Threading

THIS NEW FILM ON threading begins with a basic definition of a screw thread, then goes on to explain both tangent and radial threading. Animation, demonstrations and enlarged models provide special interest.

The complete, 16mm colored sound film on the die head story runs about 30 minutes. It is available on a loan basis from the owners, Jones & Lamson Machine Company, Springfield, Vt.

Story of the Gas Meter

DESIGN, ASSEMBLY, AND OPERATION of a diaphragm-type domestic gas meter is portrayed in "Operation 150."

The half-hour, 16mm sound and color film contains an animated sequence showing how a typical diaphragm meter accomplishes the measurement of gas.

Starting with a brief, dramatized sequence on the role gas plays in the home of today and the reasons for metering, the film moves into a detailed account of the production of meter diaphragms and body castings.

Moving through a series of precision assembly operations, the meters are shown receiving vacuum tests which prove each valve and seat assembly and assure that all will operate together without leakage.

Final assembly and testing with bell provers and water tanks are demonstrated in detail.

Of particular interest is the low-light test which proves the meter will register even a minute amount of gas —specifically the amount required to maintain a pilot light flame one-fourth of an inch in height. The meter must register 75 per cent of this flow to pass the test.

Thirty-minute long film is available for presentation to association meetings, individual companies, and educational institutions on request to Rockwell Manufacturing Company, 400 North Lexington Avenue, Pittsburgh 8, Pa., or any district sales office.

Aluminum Welding Techniques

DEMONSTRATION OF THE LATEST techniques in welding aluminum pressure vessels is one feature of the film "Welding Advances With Aluminum," produced by Aluminum Company of America.

Running for 28 minutes, the 16 mm film offers a comprehensive description of how to weld aluminum, using both the tungsten arc and consumable electrode methods. Basic concepts of these methods are explained in an animated sequence, and illustrations of their use in manual, semi-automatic and automatic aluminum welding are presented.

Also described in the film are the company's research and development facilities, which are available to help solve customers' welding problems.

Of interest to engineers, executives and welders, this film can be borrowed for group showings. Requests for prints should be made on business letterheads to Motion Picture Section, 818 Alcoa Building, Pittsburgh 19, Pa.

Solving Lubrication Problems

"NO MARGIN FOR ERROR," a new sound-slide film, in full color, contains answers to lubrication problems.

The educational film takes the audience into a typical industrial plant to show the right and wrong way to handle lubricants from "barrel to bearing."

On 35 mm film and lasting 15 minutes, the film presents five plans on lubricant handling. These plans range from the simplest hand guns and loader pumps, through bucket pumps and

INSTANT
FLOOR PATCH

REPAIRS BROKEN CONCRETE IN A HURRY!

TEST ON TRIAL OFFER

Patch broken concrete floors without tying up plant traffic. Use durable INSTANT USE — a tough plastic material which takes traffic immediately. Ideal for repairing cracks, holes, ruts. Bonds tight to old concrete . . . right up to a feather edge.

JUST TAMP! TRUCK OVER!

Simply shovel INSTANT-USE into hole or rut — tamp — and your floor is restored to solid smoothness — ready for traffic. Used indoors or out. Immediate shipment.

MAIL COUPON FOR TRIAL OFFER

INSTANT-USE

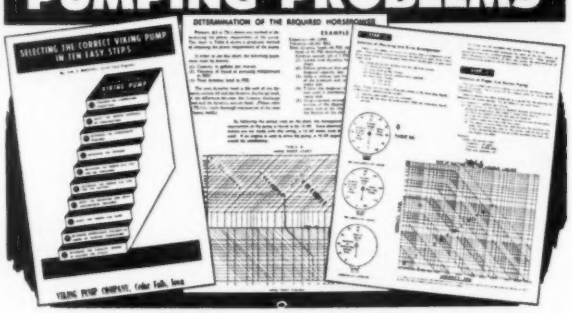
FLEXROCK COMPANY (Offices in principal cities)
3615 Cuthbert St., Philadelphia 1, Pa.

Please send me complete INSTANT-USE information, details of TRIAL ORDER PLAN and HAND BOOK OF BUILDING MAINTENANCE—no obligation. (Clip and attach Coupon to Co. letterhead.)

Name.....
Title.....
Company.....
Address.....

For more facts circle 679 on Reply Card

HERE'S MORE INFORMATION TO HELP YOU UNDERSTAND YOUR PUMPING PROBLEMS



"Selecting the Correct Viking Pump in Ten Easy Steps" is a ten-page booklet designed to help engineers in choosing the right Viking Pump for each application. This folder is free upon request.

If you would like to have one or more copies, write today for Bulletin TS-6z.

VIKING
AN HONORED NAME IN PUMPS

VIKING PUMP COMPANY
CEDAR FALLS, IOWA

For more facts circle 680 on Reply Card

"For over twelve years, the U.S. Rubber Company..."

HARRY E. HUMPHREYS, Jr.
President.
United States Rubber Company

"For over twelve years the United States Rubber Company has offered its employees the Payroll Savings Plan, whereby they can systematically and regularly save in United States Savings Bonds. Over those years, tens of thousands of our employees have joined the Payroll Savings Plan with direct benefits to themselves and their families. Such employees are better employees because with more personal security and freedom from economic worry, there is less absenteeism and personnel turnover, fewer accidents and greater employee responsibility. Such regular investment in Bonds contributes also to the economic strength of the nation. By thus promoting a sounder dollar, business also directly benefits itself. That's why we at United States Rubber endorse the Payroll Savings Plan for Savings Bonds."

Mr. Humphreys cites three important benefits of the Payroll Savings Plan: Payroll Savers build personal security ... production curves reflect serious-minded workers and reduced absenteeism ... the national economy is strengthened by a growing reservoir of future purchasing power—more than 49 billion dollars in U. S. Savings Bonds, *cash value*, held by individuals.

There is still another big advantage in the Payroll Savings Plan: it is easy to install and maintain.

If you do not have the Payroll Savings Plan, or if you have the Plan and your employee participation is less than 60%, here's all you have to do to help your employees, your company and the country:

Write today to Savings Bond Division, U. S. Treasury Department, Washington, D. C. Tell them you want to join the United States Rubber Company and the 45,000 other companies that are making an important contribution to national security and a sounder dollar.

Your State Director, U. S. Savings Bond Division, will contact you promptly. He will explain the simple procedure of installing the Plan and will show you how to conduct a simple, person-to-person canvass that will put a Payroll Savings Application Blank in the hands of every man and woman in your plant and offices.

That's all you have to do. Your employees will do the rest. They are as interested in their own future as you are in yours. Give them an opportunity to build personal security for themselves and a better America for their children.

The United States Government does not pay for this advertising. The Treasury Department thanks, for their patriotic donation, the Advertising Council and

PLANT ENGINEERING

transfer pumps, and power operated barrel pumps to a complete lubrication department on wheels.

A 12-page booklet, "Five Plans for Better Plant Lubrication," graphically emphasizes each of the five plans on lubricant handling demonstrated in the film.

In addition, the booklet points out seven distinct ways in which good plant lubrication can cut production costs in machine down time, machine repair and service, waste of lubricant, less man-hours, elimination of product spoilage, less expensive housekeeping and elimination of safety hazards.

The film and booklet are available to plant maintenance and production men from Alemite Div. of Stewart-Warner Corp., 1826 Diversey Pkwy., Chicago 14, Ill.

Palletized Work Centers

BLACK AND WHITE sound movie, illustrating a new method in light manufacturing of providing straight line production where formerly impractical, is described in a film, "How to Increase Production with Half the Cost."

Instead of the conventional method in which bench set ups are nailed down and work is carried to the machine the new style work centers are palletized. The pallets, or Work Tops, provide narrow, working surfaces which can be stacked one on top of another when not in use.

The film and a projector can be borrowed from Alden Systems Company, Alden Research Center, Washington St., Westboro, Massachusetts.

Handling Atmospheric Gases

BASIC DOCUMENTARY FILM about the atmospheric gases—oxygen, nitrogen, argon, helium and others — covering their key uses in industry, and the ways in which they appear in our daily lives as parts of familiar products, is the subject of a new 16mm color motion picture.

In "Whatever We Do," the story of how gases in pure form are separated individually from the air is described with the assistance of detailed animation. There are views of the machinery required to separate, store and package these elements.

Dramatic photography illustrates the role of these gases: oxygen in steel refining and in life-saving hospital oxygen tents; oxygen or inert gases in the welding and cutting of metals for today's automobiles, airplanes, ships, trucks and trains; neon for electric signs; argon in incandescent light bulbs; helium for lighter-than-aircraft; nitrogen in nylon manufacture, food packaging and testing telephone cables.

The film is suitable for projection at sales meetings, employee training sessions, management development meetings. Running time is 23 min.

It may be borrowed from any Air Reduction district office or by writing to Air Reduction Sales Company, 60 East 42nd Street, New York 17, N. Y.

Railroad Story

"AT THIS MOMENT" is a color story of American railroads. In and out of the great industrial centers, night and day, the railroads haul everything produced and used in this country's economy, and this film shows the railroads at these chores.

On display are the most modern devices, including the new diesel locomotives, the power that brought longer faster and heavier trains, possible only because of accompanying advances in air brakes.

For further information about this 26-minute sound film, write to the producers, Westinghouse Air Brake Company, Publicity Department, 2821 East Grand Blvd., Detroit 11, Michigan.

LOOKING FOR SPEED...SAFETY...SAVINGS?
THEY'RE YOURS WITH A

LO-HED CAR PULLER

IT'S BEEN PROVED on installations everywhere! Install a Lo-Hed Car Puller at your siding, and cars will be loaded and unloaded in far less time. You'll also eliminate a frequent cause of industrial accidents. And for full measure, your demurrage costs will be cut and you'll get no more bills for shifting charges.

Lo-Hed Car Puller is a real money-saver *inside* a plant, too. Electrically driven, rugged, it pulls anything in its capacity that can roll or slide. Write for full information.

LO-HED MEANS LOW OVERHEAD (Æ)

AMERICAN ENGINEERING
COMPANY

2470 Aramingo Avenue • PHILADELPHIA 25, PA.
AE-Products are: Taylor and Perfect Spread Stokers, Marine Deck Auxiliaries, Hydromite and Hele-Shaw Fluid Power, Lo-Hed Hoists, Lo-Hed Car Pullers.

For more facts circle 684 on Reply Card

CUT COST with FLEXAUST*

The high-quality flexible spiral-wire reinforced hose

SIZES 1¼ in. to 36 in. ID

MOVE Air, Dust, Gases, Materials BY Pressure, Suction, Gravity

Check these *Basic Economies:*

✓ **INSTALLED IN A HURRY**—Even by unskilled labor. Easy-to-connect accessories. Completely airtight. No costly layout preliminaries.

✓ **STRONG, LONG LASTING** – Bonded, double-ply. Stands up through abrasion, aging, corrosion, moisture, chemicals, unlimited flexing.

✓ **MULTI-PURPOSE** – Protects products and health from dust and fumes, improves comfort, makes many jobs simpler, more efficient.

✓ **EASY TO MOVE** – Light, fully portable, completely flexible with negligible stress for moving collector heads.

For sizes, coatings, accessories, and flow characteristics...write for catalog today.

Your local distributor has Flexaust – as well as the companion ducting, *Portovent.*

THE FLEXAUST COMPANY
Dept. PE 5, 100 Park Avenue, New York 17, New York
Formerly American Ventilating Hose Co.

FLEXAUST* PORTOVENT* BLOFLEX*
*Trade-marks

For more facts circle 685 on Reply Card

Write for Bulletin 540 today and learn how Selectotherm reduces fuel consumption and saves 20% or more compared to ordinary systems.

"TUNE IN WITH THE WEATHER"

illinois Selectotherm

Investigate this modern development in automatically controlled heating!—a high vacuum steam heating system with "single dial control" that assures the ultimate in comfort, economy and convenience. Heat supply is balanced against heat loss to provide an even and constant warmth that is always exactly right.

Ideal for schools, hospitals, churches, apartments, commercial and public buildings *of any size*—either new or existing—where boilers are used for low pressure steam heating only—with any type of fuel and any form of mechanical firing device.

ILLINOIS ENGINEERING COMPANY
2055 SOUTH RACINE AVENUE • CHICAGO 8, ILLINOIS
DIVISION OF AMERICAN AIR FILTER COMPANY, INC.

illinois ENGINEERING

For more facts circle 682 on Reply Card

CLEMENTS IT BLOWS • SUCTION CLEANS • SPRAYS

Cadillac

PORTABLE ELECTRIC
COMBINATION BLOWER-SUCTION CLEANER

MADE IN 5 MODELS ILLUSTRATED: 1 H.P.

DO YOU WANT TO CLEAN FASTER, BETTER, EASIER AND AT LOW COST?

That's a big order, but the super-efficient CLEMENTS-CADILLAC cleaning tool can do it for you—has done it for industry, business and institutions everywhere . . . for more than 40 years.

Just ask your mill supply dealer, or write us for proof. No obligation on your part.

"Most Useful Tool in the Plant"

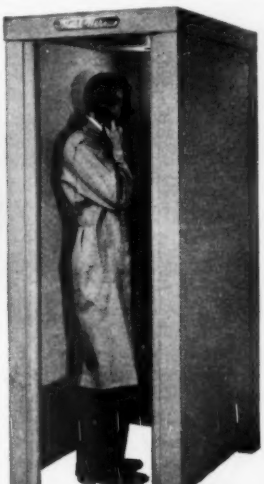
CLEMENTS-CADILLAC COMBINATION BLOWER-SUCTION CLEANERS

CLEMENTS MFG. CO., 6619 S. NARRAGANSETT AVE., CHICAGO 38, ILL.

USED BY BUSINESS AND INDUSTRY FOR MORE THAN 44 YEARS

For more facts circle 687 on Reply Card

Hear HERE!



Model 211 Floor Booth

Model 602 Wall Booth

LOUDNESS REDUCED 50%*

Inside a Burgess-Manning Acousti-Booth

- The hushed interior of a Burgess-Manning Acousti-Booth provides a quiet, restful place to hear well.
- Light, sturdy construction for ease of moving . . . compact design.
- Doorless construction . . . light, airy, well ventilated.
- Wall and floor models.
- Suited to any noisy location.

** Based on studies by a prominent research organization.*

Write for Bulletin A124

BURGESS-MANNING COMPANY
Architectural Products Division
5970-I Northwest Highway, Chicago 31, Illinois

For more facts circle 686 on Reply Card

ADVERTISERS IN THIS ISSUE

When writing to advertisers please tell them you saw their ad in Plant Engineering—or send us the number directly below ad — use the post card in "Bulletin Insert."

ACHESON-COLLOIDS COMPANY 47
Agency—John Mather Lupton & Co., Inc.

AEROTEC CORPORATION 236
Agency—Hening & Company

AIR PREHEATER CORPORATION 135
Agency—G. M. Basford Company

AIR REDUCTION 52
Agency—G. M. Basford Company

ALAN WOOD STEEL CO. 60
Agency—John Falkner Arndt & Co., Inc.

ALLEN-BRADLEY COMPANY 169
Agency—The Fensholt Adv. Agency, Inc.

ALLIS-CHALMERS MFG. CO. Back Cover
Agency—Compton Advertising, Inc.

ALUMINUM COMPANY OF AMERICA 141
Agency—Fuller & Smith & Ross, Inc.

ALUMINUM COMPANY OF AMERICA 239
Agency—Ketchum, MacLeod & Grove, Inc.

AMERICAN AIR FILTER CO., INC. 171
Agency—Doe-Anderson Adv. Agency

AMERICAN BLOWER CORPORATION 8
Agency—Brooke, Smith, French & Dorrance, Inc.

AMERICAN BRASS COMPANY 137
Agency—Kenyon & Eckhardt, Inc.

AMERICAN CHAIN & CABLE CO. 42, 43
Agency—Reincke, Meyer & Finn, Inc.

AMERICAN DISTRICT STEAM CO., INC. 147
Agency—Warman, Robbins & Gorham, Inc.

AMERICAN ENGINEERING COMPANY 248
Agency—Beatty & Oliver, Inc.

AMERICAN HOIST & DERRICK CO. 234
Agency—Ruthrauff & Ryan, Inc.

AMERICAN MONORAIL CO., THE 67
Agency—The Bayless-Kerr Company

AMERICAN SMELTING & REFINING CO. 163
Agency—John Mather Lupton & Co., Inc.

AMPCO METAL, INC. 243
Agency—Hoffman & York, Inc.

ARGUTO OILLESS BEARING CO. 237
Agency—Renner Advertisers

ARMSTRONG BROS. TOOL CO. 238
Agency—Ross Llewellyn, Inc.

ARMSTRONG MACHINE WORKS 3
Agency—Russell T. Gray, Inc.

BAKER-RAULANG COMPANY, THE 1
Agency—G. M. Basford Company

BARBER-COLMAN COMPANY 238
Agency—Howard H. Monk & Associates

BARRY CORPORATION 206
Agency—Engineered Advertising

BASSICK COMPANY, THE 82
Agency—James Thomas Chirurg Co.

BAYLEY BLOWER COMPANY 200
Agency—Barnes Advertising Agency, Inc.

BEAVER PIPE TOOLS 243
Agency—Meek & Thomas, Inc.

BETZ, W. H. & L. D. 27
Agency—The Michener Company

BOILER ENGINEERING & SUPPLY CO., INC. 209
Agency—William Jenkins Advertising

BRADLEY WASHFOUNTAIN COMPANY 214
Agency—Kirkgasser-Drew

BUCYRUS-ERIE COMPANY 202
Agency—Bert S. Gittins, Adv.

BURGESS-MANNING COMPANY 249
Agency—The Fensholt Adv. Agency

BYERS COMPANY, A. M. 155
Agency—Ketchum, MacLeod & Grove, Inc.

C & D BATTERIES, INC. 224
Agency—John T. Hall & Company

CARBIDE & CARBON CHEMICALS CO. 222
Agency—J. M. Mathes, Inc.

CAREY MFG. CO., THE PHILIP 6-7
Agency—Farson, Huff & Northlich

CASH COMPANY, A. W. 29

CHESAPEAKE & OHIO RAILWAY 160
Agency—Robert Conahay, Inc.

CHICAGO METAL HOSE DIVISION DIVISION OF FLEXONICS CORPORATION 217
Agency—Russell T. Gray, Inc.

CHICAGO TRAMRAIL CORPORATION 194
Agency—Marsteller, Gebhardt & Reed, Inc.

CLARAGE FAN COMPANY 184
Agency—William J. Williams

CLARK BROS. COMPANY 37
Agency—Harold Warner Co.

CLARK CONTROLLER COMPANY 215
Agency—G. M. Basford Company

CLEAVER-BROOKS COMPANY BOILER DIVISION 20
Agency—Klau-Van Pietersom-Dunlap Associates

CLEMENTS MFG. COMPANY 249
Agency—L. H. Gross & Associates

CLEVELAND CRANE & ENGINEERING CORPORATION 3rd Cover

COCHRANE CORPORATION 230
Agency—Hening & Company, Inc.

COLORADO FUEL & IRON CORPORATION, THE WICKWIRE SPENCER STEEL DIV., THE CALIFORNIA WIRE CLOTH CORP. 240
Agency—Doyle, Kitchen & McCormick, Inc.

C-O-TWO FIRE EQUIPMENT CO. 173
Agency—G. M. Basford Company

CRANE CO. 157
Agency—The Buchen Company

CROUSE-HINDS COMPANY 50-51
Agency—Barlow Advertising Agency, Inc.

CRUCIBLE STEEL CO. OF AMERICA TRENT TUBE CO. 55
Agency—G. M. Basford Company

DAMPNEY COMPANY, THE 64

DART UNION COMPANY 38
Agency—Sutherland-Abbott

DAY COMPANY, THE 174
Agency—Dwyer & Devoy Adv.

DAY-BRITE LIGHTING, INC. 197
Agency—Gardner Advertising Co.

DEARBORN CHEMICAL COMPANY 48-49
Agency—The Buchen Company

DEMPSTER BROTHERS, INC. 80
Agency—Charles S. Kane Co.

DIAMOND CHAIN COMPANY, INC. 9
Agency—Kirkgasser-Drew

DOLLINGER CORPORATION 195
Agency—Hutchins Advertising Co.

DRAVO CORPORATION 237
Agency—Ketchum, MacLeod & Grove, Inc.

DU PONT DE NEMOURS & CO., E. I. 227
Agency—Batten, Barton, Durstine & Osborn, Inc.

ELECTRIC CONTROLLER & MFG. CO., THE 154
Agency—Penn & Hamaker, Inc.

ELECTRIC STORAGE BATTERY CO., THE 61
Agency—Geare-Marston, Inc.

ERIE CITY IRON WORKS 14-15
Agency—Davies & McKinney

FENCE PAINTER CORPORATION 244
Agency—H. A. Hooker Adv. Agency

FINNELL SYSTEM, INC. 223
Agency—Johnson, Read & Co.

FLEXAUST COMPANY, THE 248
Agency—Hazard Advertising Company

FLEXONICS CORPORATION 217
Agency—Russell T. Gray, Inc.

FLEXROCK COMPANY 246
Agency—Walter S. Chittick Company

FULLER COMPANY 201
Agency—O. S. Tyson & Company, Inc.

FYR-FYTER COMPANY 180
Agency—Weber, Geiger & Kalat, Inc.

GATES RUBBER COMPANY, THE 21
Agency—Cloyd F. Woolley, Inc.

GENERAL CABLE CORPORATION 143
Agency—Hicks & Greist, Inc.

GENERAL ELECTRIC COMPANY APPARATUS DIVISION 17, 18, 71 thru 78, 165, 183
Agency—G. M. Basford Company

GENERAL ELECTRIC COMPANY LAMP DIVISION 204
Agency—Batten, Barton, Durstine & Osborn, Inc.

GENERAL ELECTRIC COMPANY TUBE DEPARTMENT 211
Agency—Maxon, Inc.

GOODRICH COMPANY, THE B. F. 13
Agency—The Griswold-Eshleman Co.

GOULD-NATIONAL BATTERIES, INC. 207
Agency—Hutchins Advertising Co., Inc.

GUSTIN-BACON MFG. COMPANY 210
Agency—Valentine-Radford

HARTZELL PROPELLER FAN COMPANY 252
Agency—Kight Advertising, Inc.

HEINEMANN ELECTRIC COMPANY 192
Agency—Thomas R. Sundheim

HERCULES POWDER COMPANY 187
Agency—Fuller & Smith & Ross, Inc.

HILLS-McCANNA COMPANY 176
Agency—Russell T. Gray, Inc.

ILLINOIS ENGINEERING COMPANY 249
Agency—C. Lynn Coy, Adv.

IMPERIAL BELTING COMPANY 251
Agency—Greenhaw & Rush, Inc.

INSUL-MASTIC CORP. OF AMERICA 25
Agency—Dan A. Sullivan

INTERNATIONAL STEEL COMPANY 182
Agency—Keller-Crescent Company

INVINCIBLE VACUUM CLEANER MFG. CO. 193
Agency—The Bayless-Kerr Company

I-T-E CIRCUIT BREAKER CO. 45
Agency—The Richard A. Foley Adv. Agency

JOHNS-MANVILLE, INC. 24
Agency—J. Walter Thompson Company

JOHNSON SERVICE COMPANY 63
Agency—K. E. Shepard, Inc.

JONES & LAUGHLIN 12
Agency—Ketchum, MacLeod & Grove, Inc.

JOY MANUFACTURING COMPANY 5
Agency—Walker & Downing

KELLER TOOL COMPANY 161
Agency—The Fentholt Adv. Agency, Inc.

KIRK & BLUM MFG. CO., INC. 181
Agency—The S. C. Baer Company

KOILED KORDS, INC. 243
Agency—K. C. Shenton Adv. Service

KORFUND COMPANY, INC., THE 40
Agency—Sanger-Funnell, Inc.

KRITZER PRODUCTS 83

LADISH COMPANY 185
Agency—The Cramer-Krasselt Co.

LAMSON MOBILIFT CORPORATION 188
Agency—Carvel Nelson & Powell Adv. Agency

LELAND ELECTRIC COMPANY 151
Agency—Fletcher D. Richards, Inc.

LEWELLYN MANUFACTURING COMPANY 28
Agency—Zimmer-McClaskey, Adv.

LIQUIDOMETER CORP., THE 242
Agency—Lucerna Company, Inc.

LOVEJOY FLEXIBLE COUPLING CO. 239
Agency—Symonds, MacKenzie & Co., Inc.

MANHEIM MFG. & BELTING CO. 175
Agency—Foltz-Wessinger, Inc.

MANNING, MAXWELL, & MOORE, INC. 232
Agency—Fuller & Smith & Ross, Inc.

MARLEY COMPANY, INC., THE 159
Agency—Valentine-Radford

MICRO SWITCH 177
Agency—Reincke, Meyer & Finn, Inc.

MILLER FLUID POWER COMPANY 39
Agency—Lester L. Menken Advertising

MISSISSIPPI GLASS COMPANY 19
Agency—Ralph W. Smith Adv. Agency

NATIONAL ALUMINATE CORPORATION 53-54
Agency—Armstrong Advertising Agency

NATIONAL ELECTRIC COIL CO. 189
Agency—Kight Advertising, Inc.

NEW YORK BELTING & PACKING CO. 191
Agency—Fletcher D. Richards, Inc.

NICHOLSON & CO., W. H. 31
Agency—Wilbur A. Myers

NORGREN COMPANY, C. A. 65
Agency—Walter L. Schump

NORTHERN BLOWER COMPANY, THE 164
Agency—Carr-Liggett Adv., Inc.

NYHAN COMPANY, VINCE B. 244
Agency—Robertson, Buckley & Gotsch, Inc.

OBERDORFER FOUNDRIES, INC. 241
Agency—Richards & Webb, Inc.

ORTON CRANE & SHOVEL CO. 16
Agency—W. S. Kirkland Advertising

PALMER-SHILE COMPANY 236
Agency—Alfred B. Caldwell, Inc.

PANGBORN CORPORATION 226
Agency—VanSant, Dugdale & Co., Inc.

PARKS-CRAMER COMPANY 241
Agency—The Davis Press, Inc.

PITTSBURGH COKE & CHEMICAL CO. 68
Agency—Walker & Downing

PITTSBURGH CORNING CORPORATION 41
Agency—Ketchum, MacLeod & Grove, Inc.

POLYMER CORP. OF PA., THE 46
Agency—Beaumont, Heller & Sperling, Inc.

POTTS COMPANY, HORACE T. 225
Agency—The Roland G. Ullman Org., Inc.

POWERS REGULATOR COMPANY 139
Agency—Symonds, MacKenzie & Co., Inc.

PREFERRED UTILITIES MFG. CORP. 198
Agency—Spooner & Kriegel

PRITCHARD CO. OF CALIFORNIA, J. F. 153
Agency—Carter Advertising Agency, Inc.

RADIANT LAMP CORP. 208
Agency—Joseph S. Vogel & Co.

RADIO CORP. OF AMERICA 213
Agency—J. Walter Thompson Co.

RAMSEY CHAIN COMPANY 166
Agency—Peterson & Kempner, Inc.

READING CRANE & HOIST CORP. 62
Agency—Beaumont, Heller & Sperling, Inc.

REMINGTON ARMS COMPANY 235
Agency—Batten, Barton, Durstine & Osborn

RHOADS & SONS, J. E. 205
Agency—R. E. Lovekin Corporation

RICHMOND FOUNDRY & MFG. CO. 229
Agency—Lindsey & Company

ROHM & HAAS CO. 59
Agency—John Falkner Arndt & Co., Inc.

ROME CABLE CORPORATION 203
Agency—Charles L. Rumrill & Co., Inc.

ROPER CORP., GEORGE D. 245
Agency—Cummings, Brand & McPherson

RUSTICIDE PRODUCTS CO., THE 79
Agency—The Bayless-Kerr Company

SARCO COMPANY, INC. 34
Agency—Rickard & Company, Inc.

SCHMIEG INDUSTRIES, INC. 216
Agency—Alfred B. Caldwell, Inc.

SCOTT PAPER COMPANY 81
Agency—J. Walter Thompson

SEXAUER MFG. CO., J. A. 216
Agency—Lawrence Peskin, Incorporated

SHELL OIL COMPANY 195
Agency—J. Walter Thompson Co.

SILL COMPANY, ALEXANDER 239
Agency—Arthur C. Barnett, Adv.

SKF INDUSTRIES, INC. 196
Agency—O. S. Tyson & Co., Inc.

SLY MANUFACTURING CO., THE W. W. 162
Agency—The Bayless-Kerr Company

SNAP-ON TOOLS CORPORATION 172
Agency—The Cramer-Krasselt Co.

SNAP-TITE, INC. 26
Agency—Hatch & Treat

SPENCER TURBINE CO., THE 212
Agency—W. L. Towne Advertising

SPRINGFIELD BOILER COMPANY 190
Agency—Armstrong Advertising Agency

SQUARE D COMPANY 10-11
Agency—Reincke, Meyer & Finn, Inc.

STANDARD OIL CO. (INDIANA) 57
Agency—McCann-Erickson, Inc.

STANDARD PRESSED STEEL CO. 84
Agency—Gray & Rogers

SUN OIL COMPANY 33
Agency—Gray & Rogers

SUPERIOR COMBUSTION INDUSTRIES, INC. 218
Agency—Charles H. Davis

TENNANT COMPANY, G. H. 170

TEXAS COMPANY, THE ..... Second Cover
Agency—Erwin, Wasey & Co., Inc.

THOMAS FLEXIBLE COUPLING CO. 4
Agency—Reinhold C. Ferster Adv.

THOMAS TRUCK & CASTER CO. 242
Agency—The Biddle Company

THOMPSON ELECTRIC COMPANY, THE 178
Agency—Penn & Hamaker

TRANE COMPANY, THE 22-23
Agency—Campbell-Mithun, Inc.

TWIN DISC CLUTCH COMPANY 66
Agency—Spencer-Curtiss, Inc.

UNITED STATES ELECTRICAL MOTORS, INC. 241
Agency—The McCarty Company

UNITED STATES GAUGE 179
Agency—John Falkner Arndt & Co., Inc.

UNIVERSAL METAL HOSE CO. 245
Agency—Merchandising Advertisers, Inc.

VIKING PUMP COMPANY 246
Agency—J. M. Hickerson, Inc.

WALWORTH 149
Agency—G. M. Basford Company

WARREN STEAM PUMP CO., INC. 44
Agency—The Davis Press, Inc.

WAYNE PUMP COMPANY 85
Agency—A. E. Aldridge Associates

WEST DISINFECTING COMPANY 145
Agency—G. M. Basford Company

WESTINGHOUSE ELECTRIC CORPORATION ..... 127 thru 134
Agency—Fuller & Smith & Ross, Inc.

WESTINGHOUSE ELECTRIC CORP. STURTEVANT DIVISION 231
Agency—Fuller & Smith & Ross, Inc.

WHITNEY-BLAKE COMPANY 245
Agency—K. C. Shenton Adv. Service

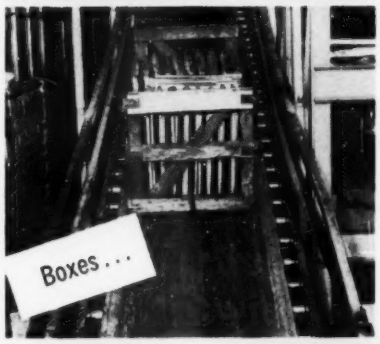
WILSHIRE POWER SWEEPER CO. 240
Agency—Roy F. Irvin

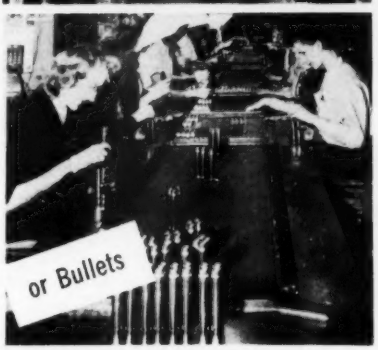
WORTHINGTON CORPORATION 233
Agency—James Thomas Chirurg Co.

YALE & TOWNE MFG. CO., THE 167, 168
Agency—Ruthrauff & Ryan, Inc.

YARNALL-WARING COMPANY 86
Agency—The Michener Company

YOUNG RADIATOR COMPANY 234
Agency—Western Advertising Agency





Whatever your product,
Imperial Belting
will cut your costs

Your belting need will be met most satisfactorily by that Imperial brand which is made expressly for *your* particular service. Proved by records extending all the way back to 1909.

Write for information and case histories

You expect more from Imperial . . . . and you get more

Imperial
BELTING CO.
1759 S. Kilbourn Ave.
Chicago 23, Ill.

For more facts circle 689 on Reply Card

these HARTZELL fans will blast away the heaviest concentrations of heat, dust and fumes

Hartzell cool blast and utility fans eliminate threatening concentrations of heat, dust and fumes before they can start trouble. That's good for production. It means higher morale, increased efficiency. Errors, accidents and absenteeism are reduced.

These sturdy Hartzell fans are built to take a beating. They're powerful brutes — designed for strength and long life. You couldn't use one in your office (they're too powerful), but out in the plant their ruggedness will really pay off.

Woven steel wire guards are guaranteed to pass all safety codes. For ease of maintenance, motors are mounted outside the guard.

For complete details, write today for your free copy of Bulletin A-109. It's chock full of valuable air-moving information.

UTILITY FAN
Stand it on the floor or mount it on wall or ceiling. Fan turns vertically in a full circle, locks in any position, 14" to 36". Sizes 24" and up also available mounted on sturdy two-wheeled carriage.
COOL BLAST FANS
Portable (shown at right) and stationary (shown in installation photo) models, 22" to 40". Heavy-duty model with cast iron base designed to be anchored to the floor, 44" to 60". Air deliveries to 60,000 CFM.

HARTZELL *propeller fan co.*

Div. of Castle Hills Corp.

Name _____

Company _____

Street & Number _____

City & State _____

If student, check here for special information ☐

Dept. S

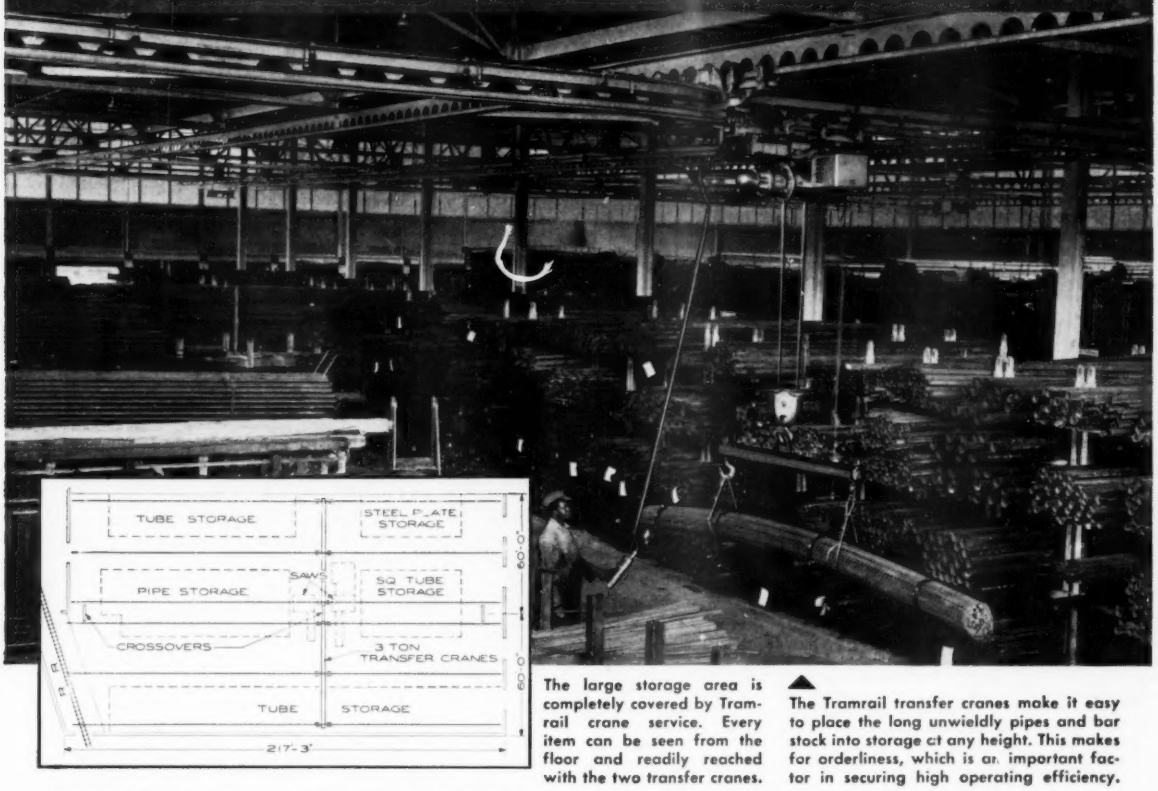
PIQUA, OHIO

PROPELLER-TYPE FANS • BLOWERS
ROOF VENTILATORS • UNIT HEATERS

ENGINEERING OFFICES IN PRINCIPAL CITIES

For more facts circle 690 on Reply Card

TRAMRAIL TRANSFER CRANES *SYSTEMATIZE* HANDLING IN STEEL WAREHOUSE



The large storage area is completely covered by Tramrail crane service. Every item can be seen from the floor and readily reached with the two transfer cranes.

▲ The Tramrail transfer cranes make it easy to place the long unwieldly pipes and bar stock into storage at any height. This makes for orderliness, which is an important factor in securing high operating efficiency.

THE BIG modern warehouse of J. M. Tull Metal & Supply Co., Atlanta, Georgia, was designed to make use of overhead Tramrail equipment to enable the handling of large unit loads in and out of storage with the least effort and in the quickest time.

The principal storage section is provided with two parallel runways each having three tracks. On both runways is a 64-foot transfer crane that travels the length of the room. Cross-overs are provided, enabling a hoist carrier transferring from one crane to the other. This makes it possible to haul materials between any two points in the entire area without rehandling.

Steel is constantly on the move in this active plant. From 60,000 to 70,000 lbs. are brought in by railroad car daily and like amounts are shipped out. The material is unloaded from railroad cars at one end of the building and placed into storage. It is shipped out on trucks which are loaded at the other end.

The overhead crane system makes it possible to place incoming materials into allotted storage spaces at once. The need of storing temporarily in aisleways or other areas and extra handling which this entails is eliminated. Thus, the warehouse is kept orderly at all times and every item is readily seen and conveniently reached. Danger of handling accidents is minimized and overall efficiency is unusually high.

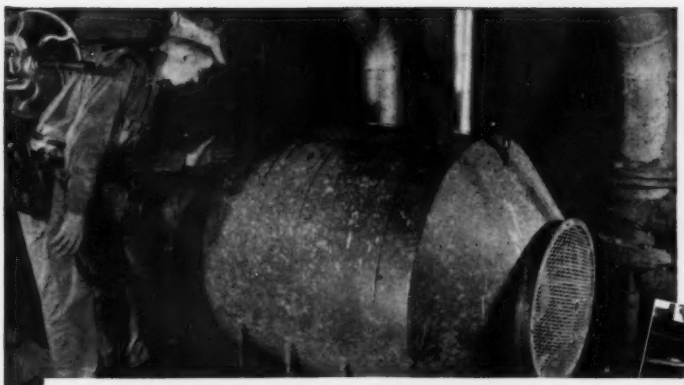
GET THIS BOOK!

BOOKLET No. 2008. Packed with valuable information. Profusely illustrated. Write for free copy

CLEVELAND TRAMRAIL DIVISION
THE CLEVELAND CRANE & ENGINEERING CO.
7581 East 284th St. WICKLIFFE, OHIO.

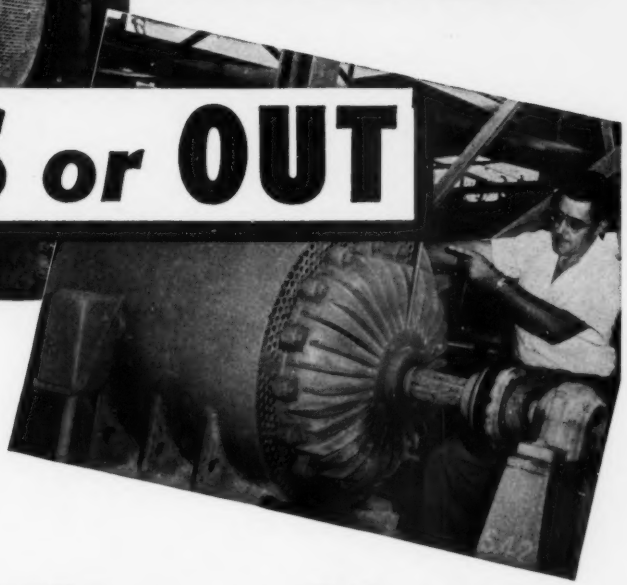
CLEVELAND TRAMRAIL
OVERHEAD MATERIALS HANDLING EQUIPMENT

For more facts circle 691 on Reply Card



Totally-Enclosed
Fan-Cooled
MOTORS

INDOORS or OUT



DIRT and CORROSION

Can't Hurt These Motors

Here is a totally-enclosed type of motor that will solve many of your dirt and corrosion problems. Install anywhere, indoors or out.

Cooling System is Self-cleaning

Cooling air is carried through the heat-exchanger tubes with sufficient velocity to expel practically any kind of dirt. If oily or sticky dirt should cling, tubes can be ramrodded clean in a few minutes because tubes are straight and tube ends are exposed.

Choice of Corrosion-resistant Materials

You can lick corrosion with this motor, too. Tubes are available in a variety of materials to meet practically any corrosive atmospheric condition. Allis-Chalmers tube-type motors have long and successful experience in such difficult applications as caustic plants, refineries and petrochemical plants, power plants with fly ash problems and many others.

Next time you need a motor for a dirty or corrosive location or for outdoor operation in all kinds of weather, call your Allis-Chalmers District Office. Get complete information on Allis-Chalmers tube-type totally-enclosed, fan-cooled and explosion-proof motors. Or write Allis-Chalmers, Milwaukee 1, Wisconsin, for Bulletin 51B7149. Available in ratings on frames larger than NEMA 505 up to 3000 hp.

A-4222

Sold . . .
Applied . . .
Serviced . . .

by Allis-Chalmers Authorized Distributors, Certified Service Shops and Sales Offices throughout the country.

CONTROL — Manual, magnetic and combination starters; push button stations and components for complete control systems.

TEXROPE V-belts in all sizes and sections, standard and *Vari-Pitch* sheaves, speed changers.

PUMPS — Integral types from ¾ in. to 72 in. discharge and up.

Texrope and *Vari-Pitch* are Allis-Chalmers trademarks.

ALLIS-CHALMERS

For more facts circle 692 on Reply Card

JUNE, 1954

Plant Engineering

IN THIS ISSUE

Air Balancing Improves Spirits at Hiram Walker 81
Temperature Rise in Motors and What It Means 84
Home-Made Automation Cuts Costs, Saves Time for Coca-Cola 86
Plant Engineers' Society Formed in Twin Cities Area 88
Factors to Consider When Selecting Abrasives 89
Case for Automatic Centralized Lubrication 92
Plant Built in a Jiffy With "Sandwich" Construction 96
How to Water-Down Industrial Odors 97
Thulium X-Ray for $40.00 99
Guide to the Use of Mastic Coatings 100
Modernization at Norton 102
Electrical Test Stands—Making Them Versatile 106
Crucible Multiplies Crane Use 108
Seeburg's Tag System Controls Quality and Reduces Scrap 110
One Tool = Four Benefits 113
Vacuum Filter Rotates As It Works 116
Selection, Use and Care of Tools 118

REGULAR DEPARTMENTS

'Round About with the Editors 2
Backtalk About Our Past Issues 28
Plant Engineers' Digest 32
Bulletins and Catalogs 37
Operation and Production 54
Court Decisions 67
News from the Plants 120
New Products and Processes 126
New Books Reviewed 177
Industrial Films 182
Data File of Commercial Literature 187
Advertisers' Index 216

Volume 8, No. 6 Circulation of this issue, 45,310

The magazine that helps plant engineers with their everyday problems